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assembly & fastener ENGINEERING

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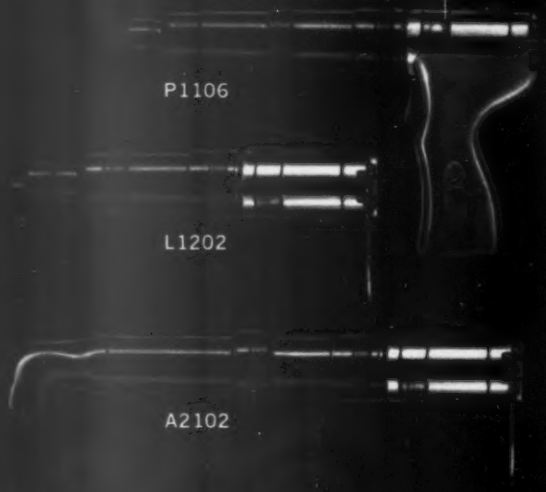

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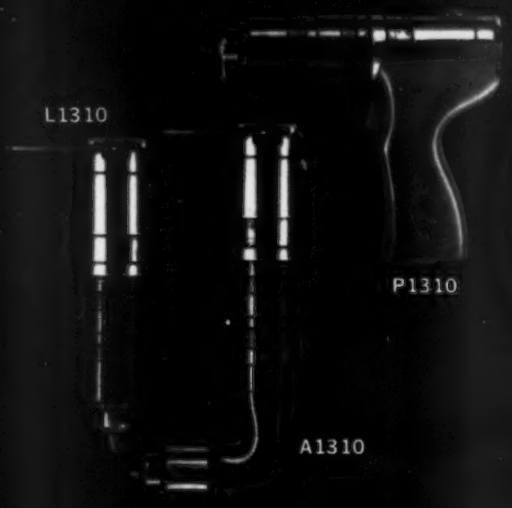

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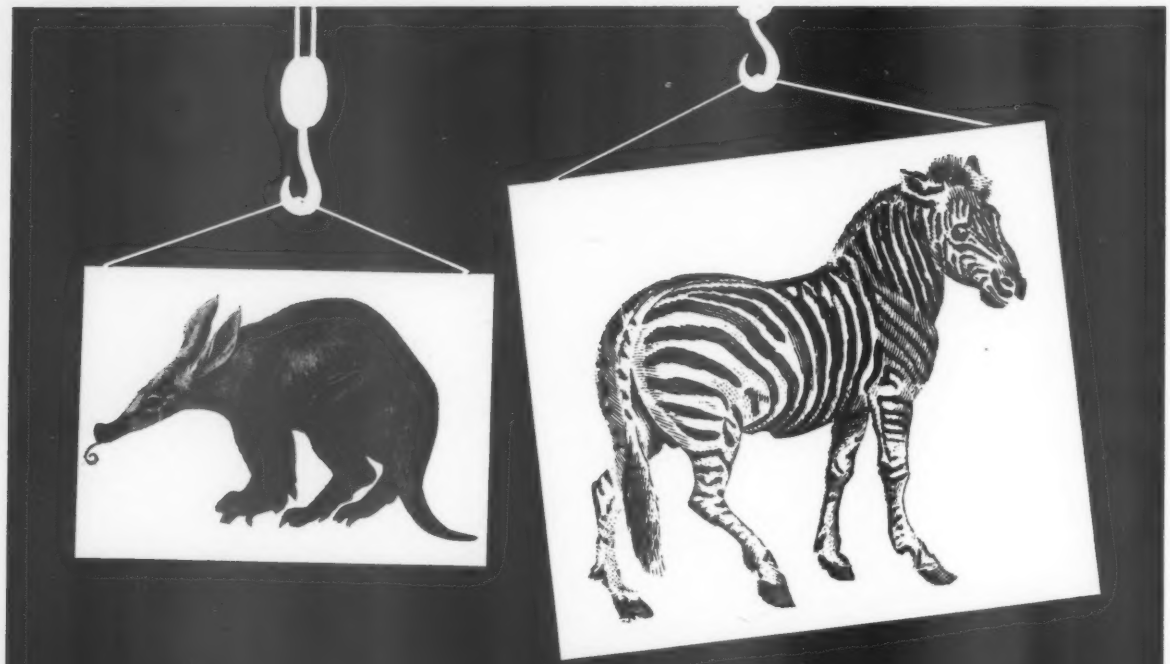

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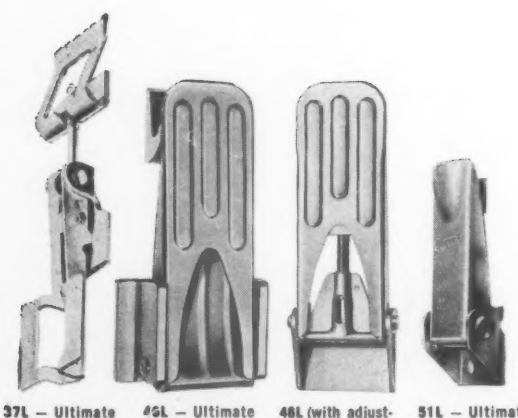

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assembly & fastener ENGINEERING

BETTER DESIGN AND ENGINEERING FOR ASSEMBLY

Volume 4, Number 8 August, 1961

Book Review—Dictionary of Automatic Control

Editorial—Automation vs. Human Obsolescence

Business Column—Industrial Statesmanship Needed

Assembly Ideas and Field Reports

Riveting Solves Assembly Problems for Miniature Switches

How Hughes Prepares and Uses Audio-Visual Instruction

Better Quality and Higher Efficiency with New Lighting

Western Electric's Computer-Controlled Resistor Line

Industrial Robot Performs Repetitive Operations

The ABC's of Power Screwdriver Bits

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Book Review

DICTIONARY OF AUTOMATIC CONTROL

by **Robert J. Bibbero**

Since the end of the Second World War, it has been generally conceded that the world is in a "second industrial revolution." The first industrial revolution, which occurred in the nineteenth and early twentieth century, concerned itself with the mechanization of many laborious operations previously accomplished by hand, or at best, by the application of crude and simple machines.

The second industrial revolution has gone one step further, in that some degree of self-regulation has been introduced in machines utilizing the basic principle of "feedback."

This feedback principle has so manifested itself that it is difficut to imagine any segment of our modern economic life where automatic control has not embedded its roots.

As a result of this dramatic advance of automatic control, the public has been subjected to a plethora of terms, expressions, definitions, symbols and other representations associated with this rather new subject. All this has taken place in a comparatively few years, so that confusion as well as saturation has made its presence felt.

More than a mere collection of definitions, the Dictionary of Automatic Control provides a condensed discussion of each topic, including applications and related subjects. The book covers control theory and basic concepts; computers and data processing; industrial machine and process control; aircraft and missile control and telemetering; control components and design factors.

An unusual feature of this volume is the classified index, which contains a subject breakdown. To find a specific word, the book may be used as one would use a conventional dictionary. If, however, the precise word or phrase sought is not known, the classified index will assist in the location of a similar term.

Accurate, convenient, up-to-date, this book represents the first important step toward a universal language of automatic control.

The language of technology is a living language. As such, shades of meaning may differ from time to time and from person to person. Because of this normal and healthy growth, a too vigorous attempt at precision is bound to be restrictive. This book has been written to serve as a guide. It should help establish the language datum for the science of automatic control and should provide workers in each specific area of automatic control with a key to the enormous literature of the field as a whole.

The Dictionary of Automatic Control may be purchased from Hitchcock's Book Division, Dept. AFE, Wheaton, Ill. It is priced at $6.00 per copy.

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For 20 years we have been making this automation machinery to produce our own light bulbs, radio tubes, fine electronics equipment. No one has ever equaled Sylvania automation machinery for accuracy and long-term dependability.

Now these machines are available to outside companies seeking this same extraordinary degree of accuracy.

Ideal for high-speed automatic fabricating, finishing, assembling, indexing, packaging, these machines are available in two general types:

1. Conveyor indexing chassis, exceptional for the extreme accuracy, strength, and versatility of its chain—not made commercially, but by Sylvania itself. Chassis also provides greater tool and driving capacity than other such chassis on the market.

2. Rotary indexing chassis in two sizes and in single and double turret models. Made with unusually great driving and tool capacity. Top of the transmission spider is specially machined for rotary vacuum or pressure valve.

Also, precision indexing transmissions (5 models)

- **Heavy-duty unit** with extra-large cam well and spider diameter for wider range of stops per revolution.
- **Standard unit** features higher cam speeds, a provision to integrally mount rotary vacuum or pressure valves.
- **Universal unit** operates with its output shaft horizontal or vertical. Has wide range of applications.
- **Small universal unit.** Lower silhouette and extra-long input shaft are main features of this extremely durable, accurate transmission.
- **Conveyor unit.** Very rugged, heavy-duty unit designed for conveyors, but easily adaptable for rotary tables, other intermittent motion machines.

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FORD

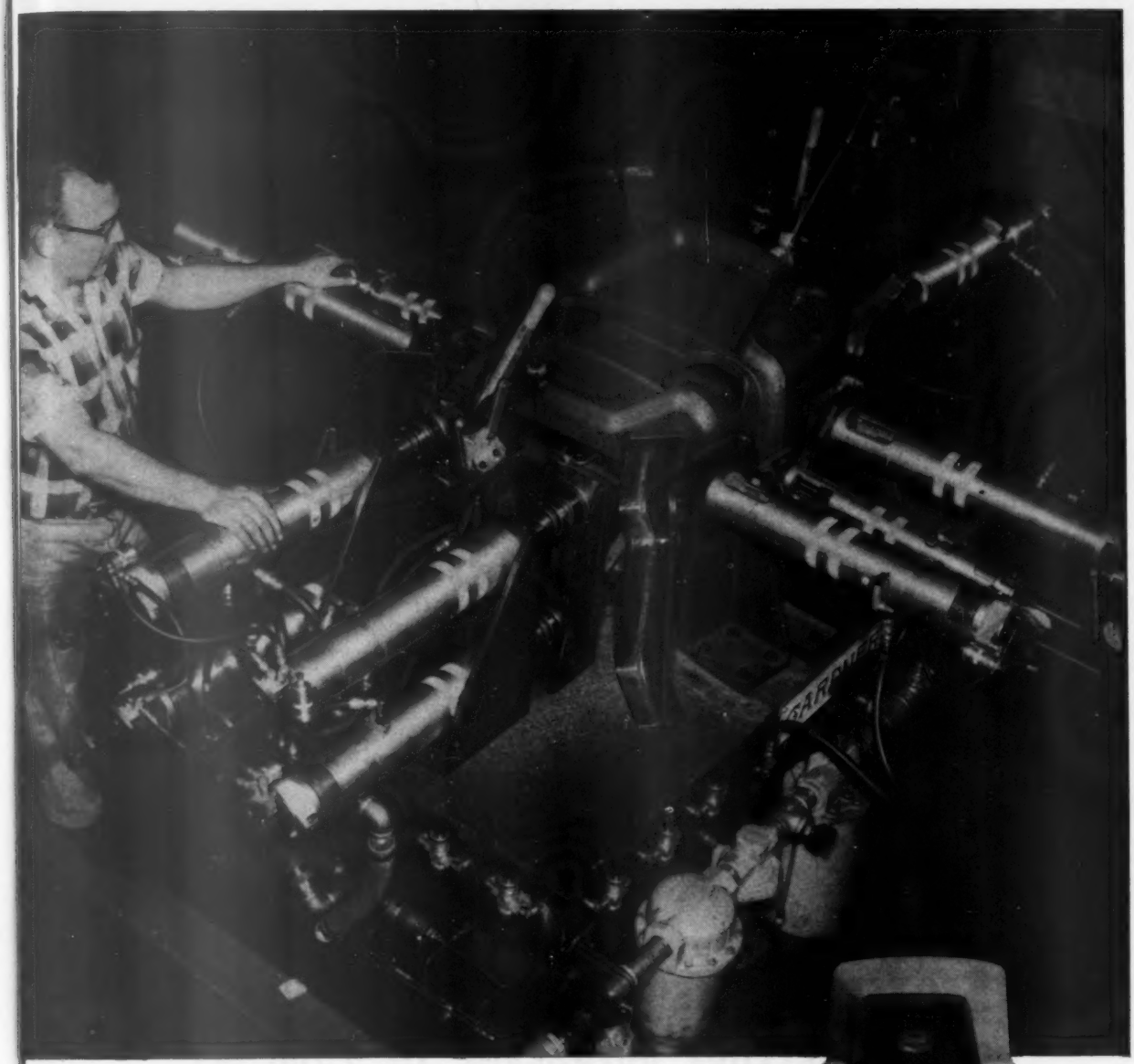
finds precision is automatic with this specially-designed air-powered machine

This Gardner-Denver automatic production drilling machine performs four precision operations on the front-end casting of new Ford 6000 tractors. It drills, spotfaces, counterbores and chamfers. Sizes range from a 7/16" drilled hole to a 2 5/8"-diameter spot-face.

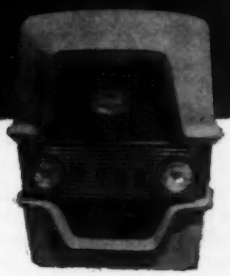
Consisting of 12 "Airfeedrill"® units in various sizes, the machine drills 21 holes in each casting. Both stationary and portable "Airfeedrills" are used. Portables are moved from one fixed bushing to another to drill as many as three holes in a casting. Other drills have multiple drilling heads attached.

Parts are loaded in the machine with a Gardner-Denver air hoist. Air positioners accurately locate the casting from the inside, and hand clamps hold parts securely for drilling.

This is just one more example of how Gardner-Denver serves the ever-changing, ever-challenging needs of automated industry. Perhaps a Gardner-Denver air tools specialist can help you. Give him a call and see.



Specially-designed Gardner-Denver automatic production machine drills 21 holes in front-end casting of new Ford 6000 tractors. Also spot-faces, counterbores and chamfers.



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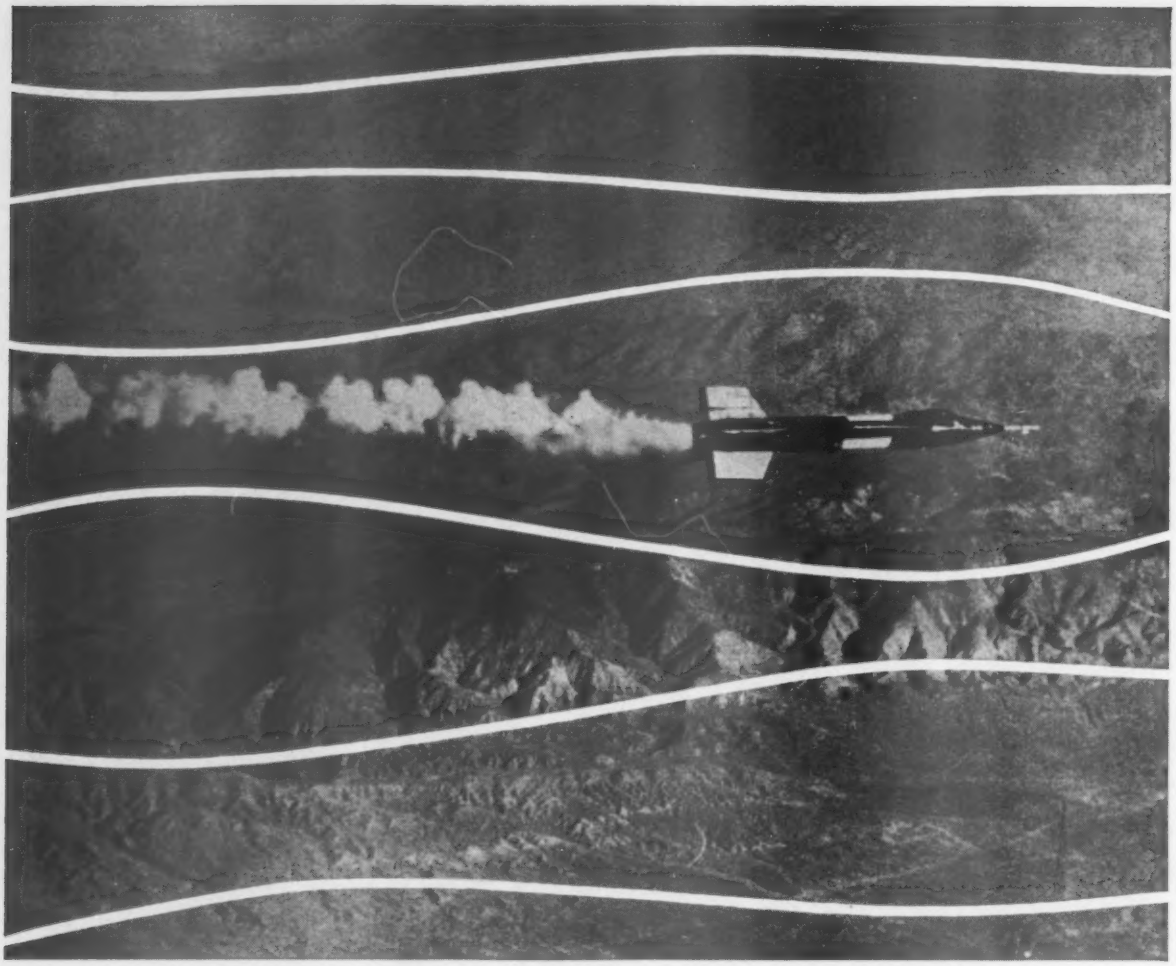


For the star-chasing X-15

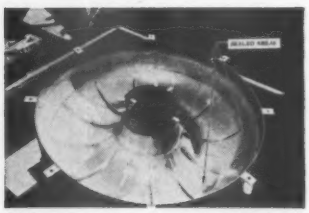
SCOTCH-WELD® SOLVES FUEL FLOW PUZZLE, SEALS PRESSURE BULKHEADS TO 3,700 PSI

BRAND STRUCTURAL ADHESIVE

One of the design puzzles North American had to solve before its X-15 could rocket into space: effective sealing of fuel tanks. Ammonia, one of the liquids which fuel the Mach-busting X-15, is carried in a compartmented tank of Inconel riveted to aluminum. Segmented bulkheads must be perfectly sealed or the fluid will not flow from one compartment to another. Of the many sealants tested, only SCOTCH-WELD Brand Structural Adhesive Film produced the seal required in the face of ammonia, other cryogenic fluids, and the extreme temperature and pressures encountered.

SCOTCH-WELD adhesives have hundreds of applications—wherever there's a problem of fastening or sealing metal to metal, or to other materials. They resist ozone, acids, water, jet fuels, other corrosives. And provide shear strength of plus 3,700 psi at 70°F., 1,650 psi at 300°F. They contain no solvents—fume disposal and drying problems don't exist! The same 3M research that created these SCOTCH-WELD adhesives can help solve the fastening problems that may be plaguing you. Why not ask your 3M Field Engineer? Or write AC&S Division, 3M Co., Dept. SBZ-81, St. Paul 6, Minn.

"SCOTCH-WELD" is a reg. TM of 3M Co.



Wherever the riveted metals of the tank meet, a SCOTCH-WELD adhesive seal provides continuous contact between mating surfaces, acts as a continuous insulating barrier of uniform thickness.

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...WHERE RESEARCH IS THE KEY TO TOMORROW

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AUGUST, 1961, VOL. 4, NO. 8

A LOOK AT AUTOMATION VS. HUMAN OBSOLESCENCE

Recently, a large-circulation newspaper carried a human interest feature entitled, "My Husband Lost His Job to Automation." It was the story of a man who had been an elevator operator for 15-years—and overnight became an obsolete man. His wife was especially concerned because he had only about ten productive years left.

Unfortunately, this man was totally unprepared for his dire straits, even though he must have been aware of the trend toward automatic elevators when he announced his first "Going up!"

Along with the soulful details of what this man's obsolescence means to his family, the newspaper included some statistics on the trend to automation. One statistic is of interest because, if fully explained, it could possibly have shown that automation is a two-way street. Here it is verbatim: "A manufacturing company used to take five days to prepare a payroll for 2,000 employees. Its new computer now takes two days for a payroll of 4,000."

There was no editorial comment on this matter-of-fact statistic. Thus the average reader of the paper, already emotionally charged up as to the "evils" of automation in general, probably would now damn computers in particular as instruments of human obsolescense.

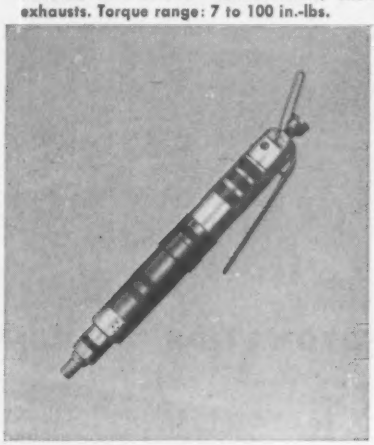
But let's take a brief second look at this statistic. Just where did those 2000 additional employees come from? Could their jobs possibly have been created because of automation? It would seem that there would be more of a story in the creation of these 2000 extra jobs than in the sob story about one unfortunate obsolete man.

To belabor this thought further, where would our nation be today without automation and other technological advances which are keeping our factories operating profitably despite intense competition from the rest of the industrial world with its lower wages. Would we still have the highest standard of living in the world? Would we still have 68 million gainfully employed in spite of a recession?

Editor

NEW "DIAL TORK" Nutrunner. The only power tool you can "dial in" for the precise torque you want. Ideal for the type of assembly or service work where a variety of fasteners must be tightened to different torque settings—with hand torque accuracy.

"One-Shot" Air Screwdrivers with offset or lever handles; reversible or non-reversible; silent exhausts. Torque range: 7 to 100 in.-lbs.



✻ The secret of CP "One-Shot" Fastener Driving Tools lies in the precise torque sensing ability of the tools themselves. Put the tool on the work—press the throttle—the instant precise torque is attained *all* driving action stops. Its torque-awareness is unequalled by *any* clutch for *accuracy* and *consistency*. So don't just specify "torque control"... be *sure* you specify CP "One-Shot."

CP "One-Shot" Screwdrivers can save up to 75% in fastener driving time... eliminate stripped threads.

Chicago Pneumatic

PNEUMATIC TOOLS • ELECTRIC TOOLS • AIR COMPRESSORS • DIESEL ENGINES • HYDRAULIC TOOLS • AVIATION ACCESSORIES

"One-Shot" Electric Screwdrivers with lever or offset handles. Torque range: 7 to 100 in.-lbs.

"One-Shot" Angle Nutrunners are jolt-free... easy to hold! Fasteners installed accurately to torque specifications. Range: ½ to 200 ft.-lbs.

CP-200 Torque Analyzer provides fast, simple method for checking clutch settings and stall torques of portable tools. Maximum capacity: 200 in.-lbs.

If your responsibility is threaded fastener driving... DON'T JUST SPECIFY "TORQUE CONTROL" ...SPECIFY CP "ONE-SHOT"* FOR THE ULTIMATE IN TORQUE ACCURACY, CONSISTENCY!

Since the first CP "One-Shot" torque control power screwdriver was introduced in 1954, industry has come to realize the *real plus values* of the consistent accuracy these tools maintain. They have proved their money-saving advantages because:

1. They cut spoilage and rejects to a minimum.
2. "One-shot" principle reduces clutch wear to the minimum... torque settings remain constant indefinitely... but are readily adjustable over a wide range when job specifications demand it.
3. They make training of operators easier and faster... simplify changes in work assignments.

CP manufactures the most extensive line of "one-shot" tools available today. Let a CP Torque Control Specialist help you solve your fastener driving problems. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N.Y.*

"One-Shot" Nutrunners hold their settings... simplify training of operators.

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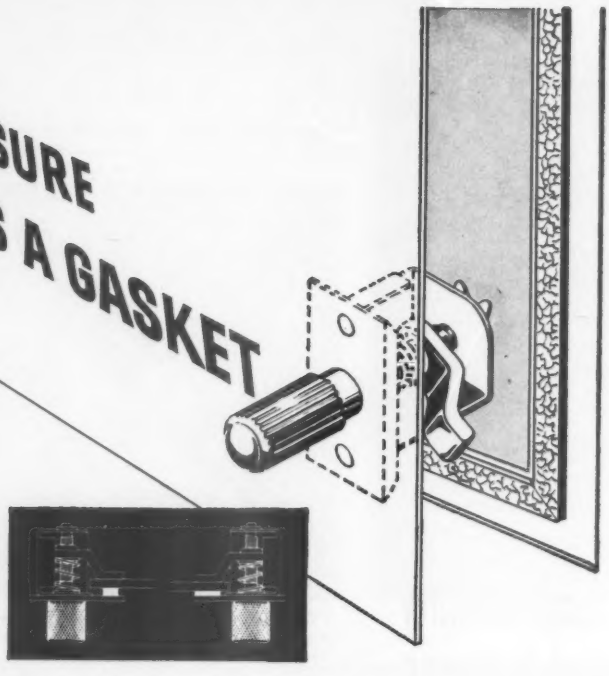
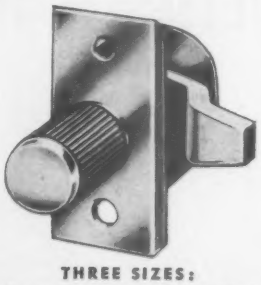
FOR A TIGHT CLOSURE
OR TO COMPRESS A GASKET



SOUTHCO

Adjustable Pawl FASTENERS

¼ turn closes—additional turning tightens



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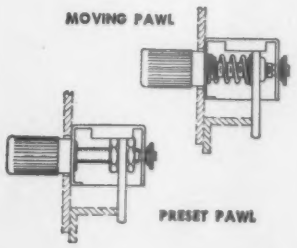

Just slip the knob through a hole in the door (any door thickness—it doesn't matter). Fasten with two rivets, bolts, or welds. The Southco Adjustable Pawl Fastener will fit your door frame, even when material gauge varies between units.

Turn the knob. The first quarter turn latches the door. Now keep turning. You're pulling the door tightly against its frame. You can compress a gasket, form a dust or moisture seal, overcome vibration.

You'll save installation time and satisfy your customers with these rugged, attractive, pre-assembled fasteners. Ideal for heavy machines, electronic consoles, miniaturized units, cabinets, missiles, slide-mounted modules, etc.

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Send for your free copy of Southco Fastener Handbook. Gives engineering data on many fasteners. Write to Southco Division, South Chester Corporation, 257 Industrial Highway, Lester, Pa.

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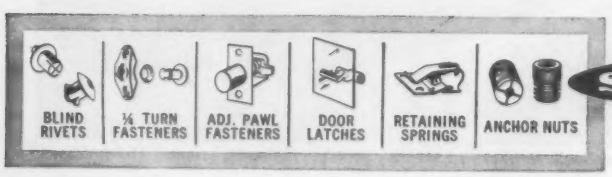

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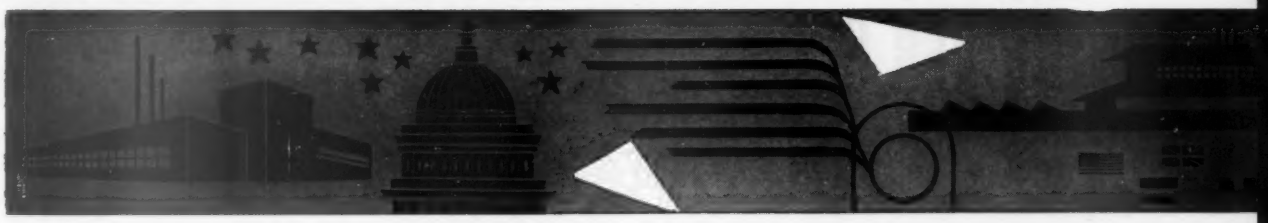
The State of Business



INDUSTRIAL STATESMANSHIP

NEEDED AT THE INTERNATIONAL LEVEL

by **R. F. Orth,** Senior Operating Vice President, Johns-Manville Corporation.

With the world rapidly increasing its capacity to produce raw materials and finished products, there appears to be a revolutionary shift in economic thinking. Many nations pay lip service to the ideals of free trade; but as a matter of cold fact, the trend is toward self-interest and economic self-sufficiency either by individual nations or groupings of nations into economic blocs.

We have the European Economic Community, the Inner Six; the European Free Trade Association, the Outer Seven. In Latin America, an economic grouping is taking place. In the Middle East, the United Arab Republic has preferential tariffs and is studying the possibilities of establishing a common market.

The Soviet Union dominates markets of its satellites and has already declared economic warfare on the Free World. Through its brutal communes, Red China has enslaved its millions in a gigantic effort to transform itself from an agrarian to an industrial economy. And Africa is beginning to bestir itself.

Here in North America, economists have been seriously proposing formation of a common market embracing Canada, the United States, and Mexico.

Of course, in this struggle for economic and political survival our greatest threat comes from the Kremlin and Peiping. Khrushchev believes in co-existence of a sort; but he is determined to rock the Free World by using economics as an instrument of his enslaving political ambitions. Co-existence is not part of Communist China's policy. While the methods of Peiping and the Kremlin may differ, their objectives are the same.

Under the circumstances, we must improve our competitive position in world trade. We too, must be motivated by self-interest in the economic sphere, if we are to strengthen ourselves in the political field.

However, self-interest should not call for sabre-rattling or for flexing our brawny muscles in defiance at other countries. Nor does self-interest call for a return to economic isolation. Rather we should increase our efforts to encourage free trade and interchangeable standards among nations.

This is easier said than done. World tensions have increased tremendously; and these tensions make the task exceedingly difficult. To encourage free trade and to promote universal standards—and at the same time protect our own interests—requires industrial statesmanship of the highest order at the international level.

More often than not in the past, we have lost many a battle by default—particularly in the field of international standards. American industry has not given either financial support or personal participation that is so vital in this area. Yet in our own interests we should give support to the far-sighted programs of the International Organization for Standardization, called the ISO, and the International Electrotechnical Commission, the IEC.

By not providing adequate representation at ISO and IEC meetings, we have tacitly permitted the adoption of standards at variance with American standards. Our failure to take a more active part has hurt us two ways.

Apart from restrictive trade barriers raised against our products for purely political and economic reasons, many American products are also barred entry into foreign countries because our standards and specifications differ from those abroad. More than 1900 of our standards, approved as American Standards by the ASA, have yet to be translated for use in foreign countries.

Let's look at the other side of the coin. Many foreign products enter this country at a competitive advantage over our products because we of American industry have not insisted that they be brought up to our American standards.

Our British cousins have a reputa-

continued

Orth has been senior operating vice president of Johns-Manville since Jan. 1960. He has been a member of the J-M organization since 1924. He is also a director of Macon Smith & Co. of Memphis, Tenn., investment counsel and consultant in corporate finance.

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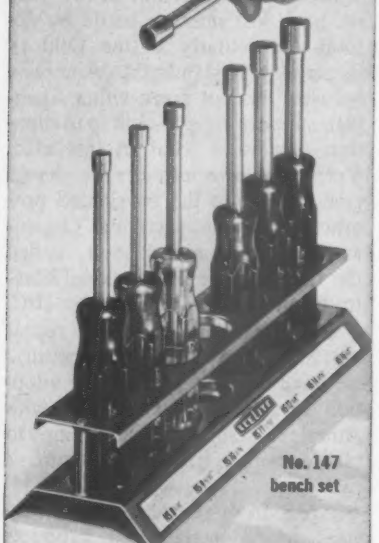

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tion for being realistic. They participate in almost every ISO and IEC committee. And they wonder why we do not have more representation at these meetings; they deplore the fact that we American businessmen do not take a more active part in these international meetings, particularly when we have so much to offer in the technical field.

As for the Russians, you can bet your inflated dollar that they are not missing a thing. Their technical men are highly talented; they are present and accounted for at ISO meetings.

Russian technicians pursue their objectives with a remarkable harmony that appears to be devoid of politics. We would be complacent, indeed, if we overlooked the obvious; in this day and age economics, politics, and international diplomacy are as interdependent as Siamese twins.

Therefore, it is not for us to complain that the Rusians are in there pitching for standards that will promote Moscow's interests. Rather, we should be in there pitching for American interests.

It behooves us to bestir ourselves. Specifically, what should we do?

In the first place, let us prevail upon American industries to give greater support to the ASA.

Secondly, while industry is showing increased interest in this field, we should have more American representation on every ISO committee. That is the only way our voice will be heard in these international councils that have such an important bearing on American businesses. At these working group meetings, we should be sure that we have the right kind of representation to put forth American viewpoints. Compromise is part of the give and take that prevails at these sessions. Even so, our experience has demonstrated that our viewpoints are widely respected and, therefore, are frequently written into international standards.

As a protection to the American consumer, we should also persuade our importers to accept only those goods that meet our standards. And to strengthen our export trade, we should see that our exporting firms are well-versed in the standards of foreign countries that differ from ours.

Unfortunately, many Americans have smugly assumed that U.S. industry is without a peer. Let's not be like the ostrich who is supposed to bury his head in the sand. Let's face it!

Other people in this world have ideas—and good ones, too. And, maybe these ideas are better than ours. Many American companies are literally reeling and staggering about—wondering what has happened to them. And a part of what has happened is this rapidly developing highly competitive international trade picture. We will get nowhere if we whistle in the dark, assuring ourselves over and over that we have the biggest and the "mostest."

We Americans in industry, those of us who can influence policy, have got to do what Americans are famous for. We have to show some free-enterprise initiative in international trade circles. And we can do it by promoting our high quality standards. •

This article is based on an address by Mr. Orth at the Eleventh National Conference on Standards conducted by the American Standards Association.

Business Briefs

Steel production for the first half of 1961 is expected to reach about 45 million net tons, a 17% increase over the first half of 1960, reports Joseph L. Block, chairman of Inland Steel Company.

The report was contained in a semi-annual business outlook booklet issued by the First National Bank of Chicago.

Steel consumption can be expected to increase at a rate commensurate with the business recovery. The amount of steel which buyers will add to their stocks is far more difficult to predict, the report concluded.

Based on a strong business recovery, 1961 steel production is expected to be about 5% ahead of 1960. The index of production for the second half of 1961, based on the 1957-59 average of 100, is expected to be 119. The second half of 1960 it was 79. •

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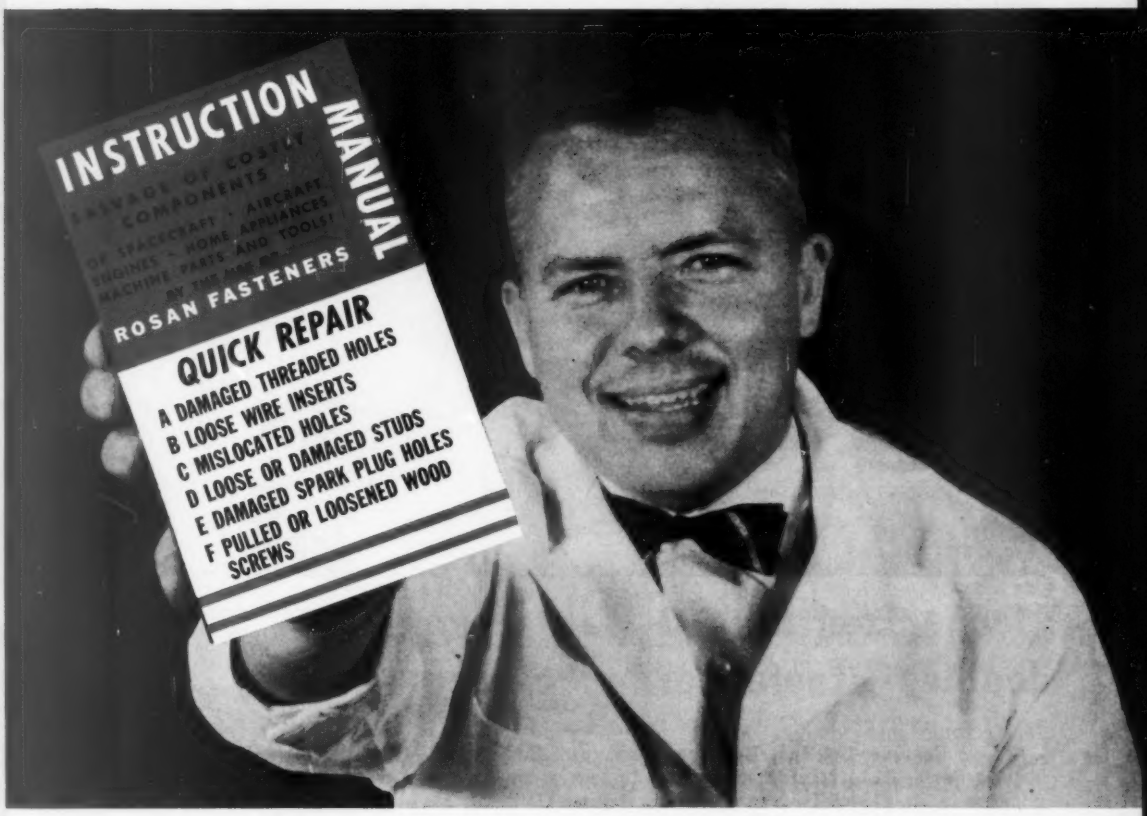

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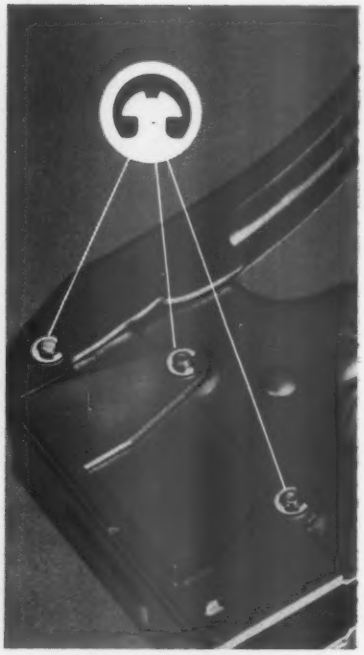

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Mechanized Ring-O-Mat® designed by Truarc Engineers doubles stapler production for saving of $2500/year

Arrow Fastener Co., Inc., Brooklyn, N. Y., uses three Truarc Series 5144 reinforced E-rings to secure components in its Model T-50 compression stapler. Originally, Arrow operators installed the rings by hand with conventional applicators and dispensers. Fast? Sure — but Truarc engineers suggested to the company how the job could be done even faster and more economically by mechanizing the entire ring assembly operation.

Working closely with the Arrow engineering and production staff, Truarc mechanization engineers designed the unique Ring-O-Mat shown above. The unit installs the three E-rings in a single operation, twice as fast as the former hand method. Savings with the equipment are $2500 a year — enough to pay for all the rings the company uses!

Here's how the Ring-O-Mat works. The Truarc rings are supplied in tape-wrapped Rol-Pak® cartridges which are loaded on vertical magazine rails at the center of the unit. To install the rings, the operator merely places the stapler in a nest at the front and pushes the control buttons . . . the Ring-O-Mat does the rest! Applicators connected to the air cylinders grasp the bottom ring in each stack and move forward, seating the rings in accurately located grooves pre-cut in pivot pins extending through the body of the stapler. When the rings are fully seated, the applicators are withdrawn automatically and the operation is completed. Simple, fast, fool-proof — a typical example of how Truarc retaining rings lend themselves to mechanized assembly. A good example also of how you get *more* than a fastener when you buy Truarc!

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Bulletin 459-13 describes a number of assembly techniques for mass-production ring installation. Write for a copy or see your Truarc representative.

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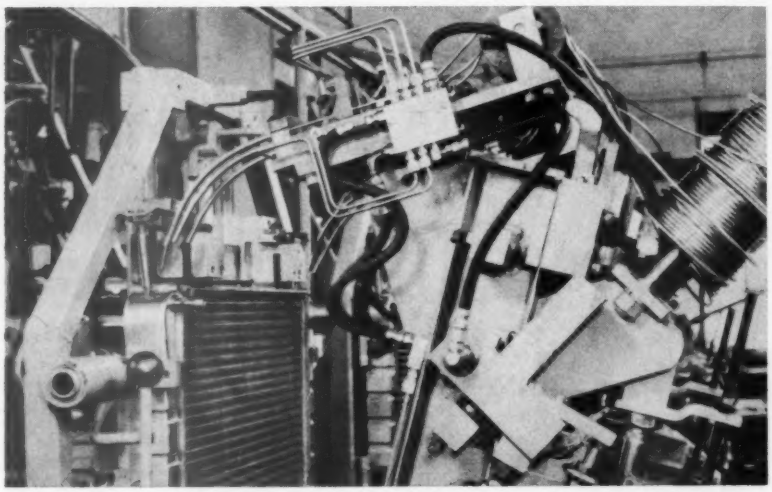
Ideas and Field Reports

AUTOMATIC SOLDERING

SPEEDS AUTOMOBILE RADIATOR ASSEMBLY



Automatic soldering operations being performed in station 11 to assemble one side support bracket to radiator core. Automatic soldering machine (below) is designed to produce 206 radiator assemblies per hour at 80% efficiency.

An automatic automobile radiator soldering machine and a supply tank soldering machine are used to increase production rates of automobile radiator assemblies. The units were designed by Expert Welding Machine Co. of Detroit, Mich.

The automatic units have aided the radiator manufacturer to improve product quality, also.

The new machines are designed to produce radiator assemblies at a variable production rate and replace 90% of the handwork previously required to produce a leak-proof radiator.

The radiator unit automatically solders two tank and two side support brackets to the radiator core.

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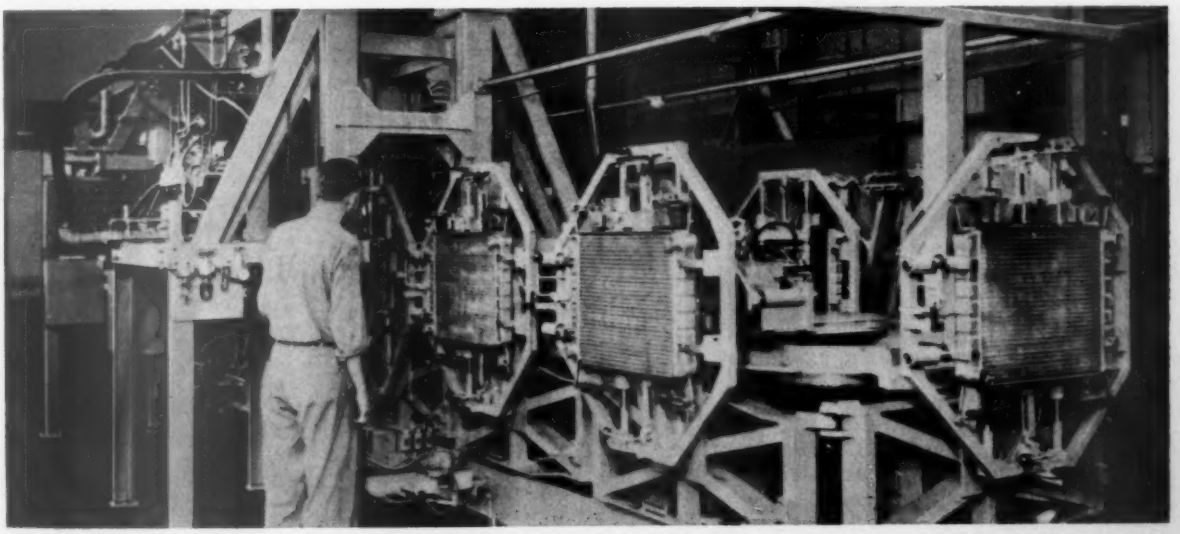


The fixtures are adjustable for height and width to accommodate different sized radiators.

The supply tank unit is a 16-station rotary index type machine with five working stations to solder various water connections and brackets.

During the soldering operation, the joints are heated to the proper temperature by gas burners. The solder wire is then automatically fed to the proper joint positions by a solder feed mechanism. The solder flows in the joints to provide a completely sweat-soldered joint.

The fixtures are rotated to various positions for each of the five soldering stations during the indexing operations.

To begin the soldering operations in the assembly, the pre-fluxed core and both tank sub-assemblies are manually loaded and clamped in the fixture at the first station. The remaining operations are all automatic.

FAST-DRYING ADHESIVE FOR QUICK PARTS ASSEMBLY

A fast drying, synthetic rubber adhesive allows parts assembly within two to five minutes after application. It is effective for bonding porous materials such as urethane foam to metal, and is recommended for bonding a number of other materials.

The adhesive, Bostik 1142, made by B.B. Chemical Co., is applicable to two military specifications; MIL-A-1154-A and MIL-A-5092-A, Type II.

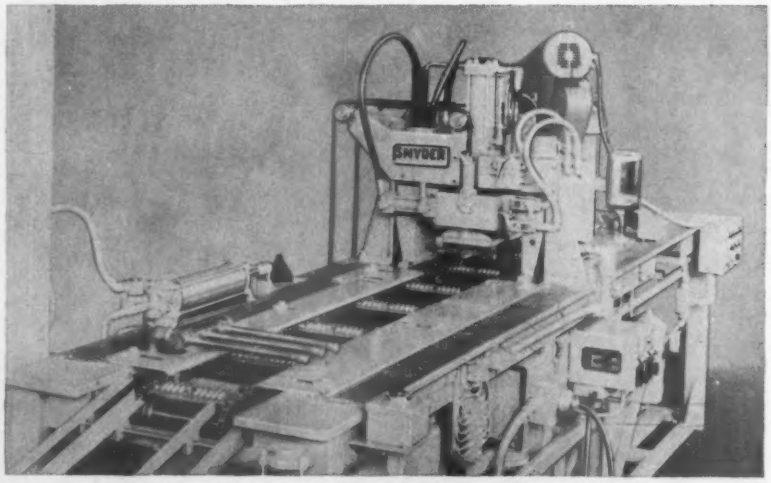
Specific tasks reported as accomplished effectively with the adhesive include the bonding of insulating material to the undersides of automobile hoods, and felt and rubber gaskets to vacuum cleaners.

AUTOMATIC UNIT DIP-SOLDERS PRINTED CICUITS

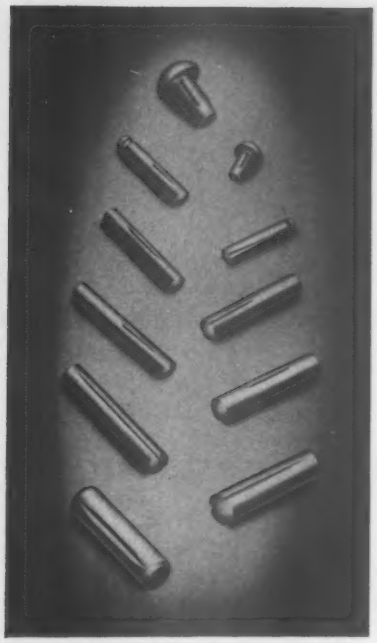
An automated type of straight-line machine dip-solders electronic printed circuit boards at a cycle rate of one every 17 seconds. The ten station machine, made by Snyder Corporation, Detroit, Mich., is designed to avoid hand or semi-manual fluxing operations as well as bridging and dross problems often encountered in roll-soldering set-ups.

The 12′ long machine indexes the circuit boards from station-to-station by fingers on a stainless steel roller chain that travels in adjustable channel-type ways. A hydraulic cylinder indexes the chain through a slip-clutch unit.

The boards are manually loaded



Dip-soldering machine viewed from the unload end with the bonnet removed.



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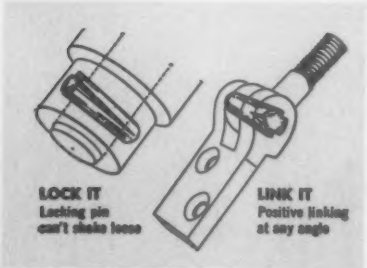

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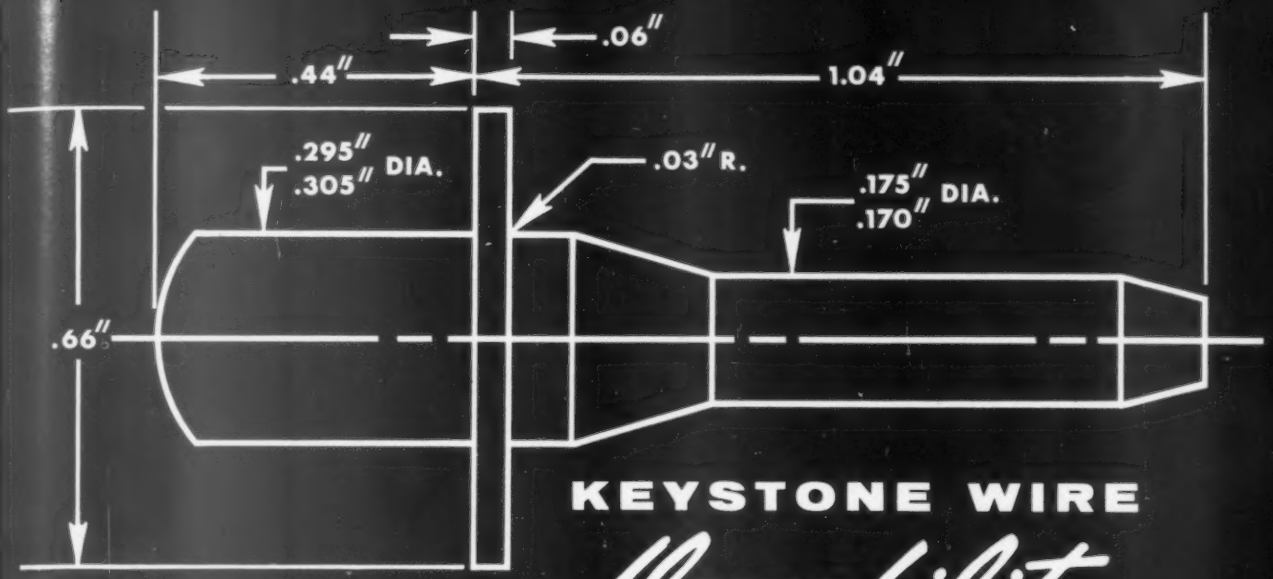

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Dean Tollefsrud, Purchasing Agent for Elco, reports, "We have had excellent results from Keystone Steel & Wire Company C-1038 Special Process Wire in making this plunger." Adds Louie Zanin, Process Engineer, "Production runs and die life have been good for this difficult heading job. We have been successful in forming this part even though specifications are critical."

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into the fingers at the first station. The rest of the operation is automatic.

At the final station, the boards slide out of the chain into a chute, where they are inspected and manually loaded into portable pallets.

The entire machine is provided with a vented bonnet to carry away fumes. Sliding glass panels in the bonnet permit visual inspection and access for each station.

BRAZING ALLOY CUTS STAPLER ASSEMBLY COSTS

In the selection of a joining method for small components for a line of stapling machines, Bostitch of East Greenwich, R.I. chose nickel-silver brazing with an automatic fluxing system. Production brazing with the alloy and the automatic fluxing system saved the company nearly $1,000 in time, labor, materials and finishing costs.

Sub assemblies for large industrial hammer-type staplers are brazed with nickel-silver and automatic fluxing. Overlapping of pieces speeds brazing.

Among the specifications that had to be met by the joining method and filler alloy were close tolerances and post-joining heat treating on small intricate parts. These parts were fabricated from several different steel and copper alloys. Other specifications were: no heat distortion, constant alignment during the manufacturing operation and high-strength bonds that would withstand rugged use during the life of the product. Finally, each part had to have a minimum of aftercleaning and finishing and be ready for chrome-plating.

Close up of small steel sub-assembly shows steel hook brazed into place on upper end of channel. Unfilled lanced hole, lower down on the channel, must be filled flush with the surface.

When production first began, it was discovered that other methods did not meet tolerance specifications. Nickel-silver brazing was tried and the most suitable alloy was selected.

The alloy chosen is manufactured by All-State Welding Alloys Co., Inc. It is their No. 11 silver-nickel rod and it is designed to replace all conventional bronze steel and cast-iron brazing rods for torch application.

The No. 11 nickel-silver rod melts at 1630° F, flows at 1750° F and develops an average tensile strength of 70-80,000 psi and shear strengths of 120-160,000 psi.

AUTOMATIC DATA UNITS CHECK COMPONENT QUALITY

A line of quality information and test systems that can automatically test electrical components and circuits, classify data, and compute trends have been developed by General Electric Co. of Schenectady, N.Y. The units are designed to help automate industrial quality control on an economical basis.

The units provide test data in a form readily usable for analysis and control of the process. They are designed around pretested, modular construction elements, and provide a high degree of flexibility to meet changes in product and process test requirements.

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a. ☐ *undersized* *b.* ☐ *same size*
in relation to major diameter of standard bolts.

2. As bolt threads enter the nylon locking collar they
a. ☐ *cut* *b.* ☐ *impress*
perfect mating threads and bring bolt and nut thread surfaces into firm metal-to-metal contact.

3. An Elastic Stop nut
a. ☐ *increases* *b.* *diminishes* *c.* ☐ *eliminates*
wear producing axial play between bolt and nut.

4. Upon removal from the bolt, the nylon collar of an Elastic Stop nut
a. ☐ *retains its thread impressions.* *b.* ☐ *tends to resume its original shape.*

5. A nylon insert Elastic Stop nut can be re-used without losing its locking torque
a. ☐ *10 times* *b.* ☐ *25 times* *c.* ☐ *over 50 times*

6. An Elastic Stop nut will
a. ☐ *always* *b.* ☐ *sometimes* *c.* ☐ *never*
seize, gall or remove plating from bolt threads.

7. An Elastic Stop nut can be
a. ☐ *more accurately* *b.* ☐ *less accurately*
prestressed than an all-metal nut.

8. Regardless of vibration, impact or stress reversal an Elastic Stop nut will stay put
a. ☐ *anywhere on the bolt.* *b.* ☐ *only when torqued against the work.*

9. Fuels, lubricants, moisture
a. ☐ *can* *b.* ☐ *cannot*
seep past the chemically inert locking collar to cause corrosion of internal bolt-nut threads.

10. The single-unit Elastic Stop nut costs approximately
a. ☐ *more* *b.* ☐ *the same* *c.* ☐ *less*
to install than a castellated nut and cotter pin, or a double nut.

Check Your Score

1 *a.* 2 *b.* 3 *c.* 4 *b.* 5 *c.* 6 *c.* 7 *a.* 8 *a.* 9 *b.* 10 *c.*

Write Dept. S62-897 for Elastic Stop nut Bulletin describing hundreds of Elastic Stop nut hex shapes and sizes—from 0-80 to 4"—in carbon and stainless steels, brass, aluminum and other alloys, in all standard finishes.

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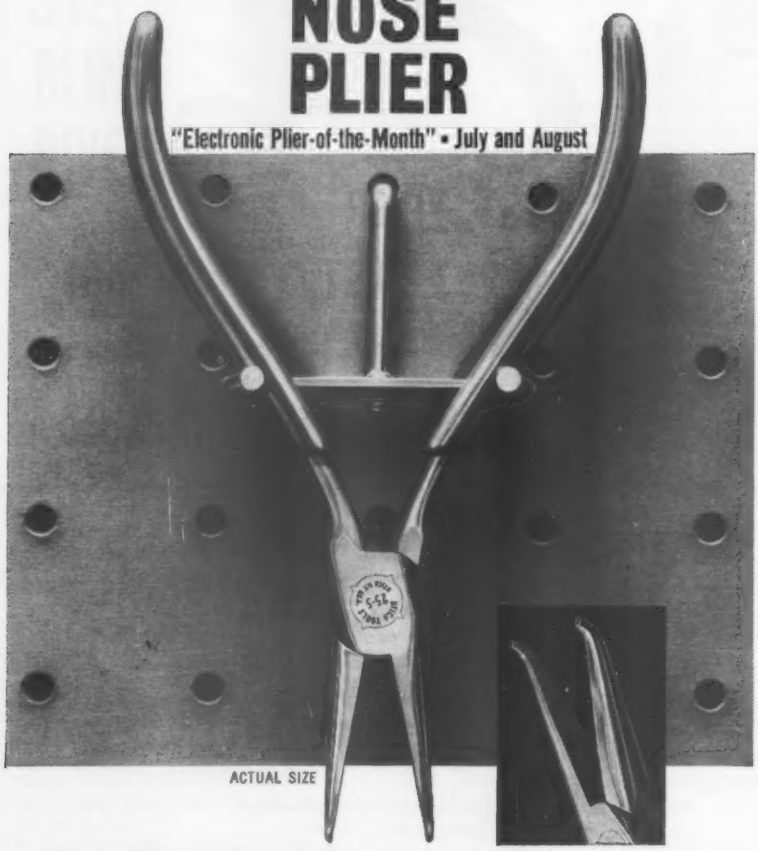

Never before available on an industry-wide basis! This month's Utica special is the #25-5 . . . a new bent chain nose plier designed to grip, twist and loop very fine wire in closely confined areas. It's ideal for work on chassis as well as other subminiature electronic assemblies. Special features include 60° angle bent chain nose • Beveled edges full length of jaw • Fine serrations in jaws to prevent nicking or marking • Primer coated *dipped* cushion grip handles and Bauer spring to reduce operator fatigue • Induction hardened edges • Gleaming finish • Backed by Utica's famous full guarantee. Write for complete information on the #25-5 or the Utica Electronic Plier of the Month program. Or ask to have your Utica distributor call!

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UTICA

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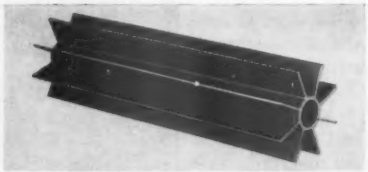
ing function gives a print-out record of product performance.

Presently designed units include an automatic relay tester, three models of a transformer tester, multicycle reliability tester, a programed automatic circuit tester, a basic appraisal system for incoming components and a dynamic circuit analyzer.

HIGH FREQUENCY UNIT WELDS HEAT TRANSFER FINS

High frequency welding, a method of heating and forge welding metal together at high speeds is being used to weld heat transfer fins to pipe. The application has uses in heat transfer equipment used in power stations and atomic reactors.



The equipment and techniques for the welding have been developed by Thompson Electric Welder Co. As many as eight steel and stainless steel strips have been welded edgewise to a small diameter tube at speeds of 160 fpm.

The area affected by welding heat is small. There is little distortion of the parts during the operation. Welded seams are quite small, at times barely visible.

In addition to the mild and stainless steels, it is possible to weld copper, aluminum, zirconium and many of the exotic metals.

STRENGTH IN METALS IMPROVED BY BATH PROCESS

A low temperature molten salt bath process results in increased resistance to wear, surface durability and fatigue strength of ferrous metals, rather than increasing hardness. The process was reported to the American Gear Manufacturers Association by John Erler, Chairman of the AGMA Metallurgical Committee. He is consulting metallurgist for Farrell-Birmingham Co., Inc., Ansonia, Conn.

continued

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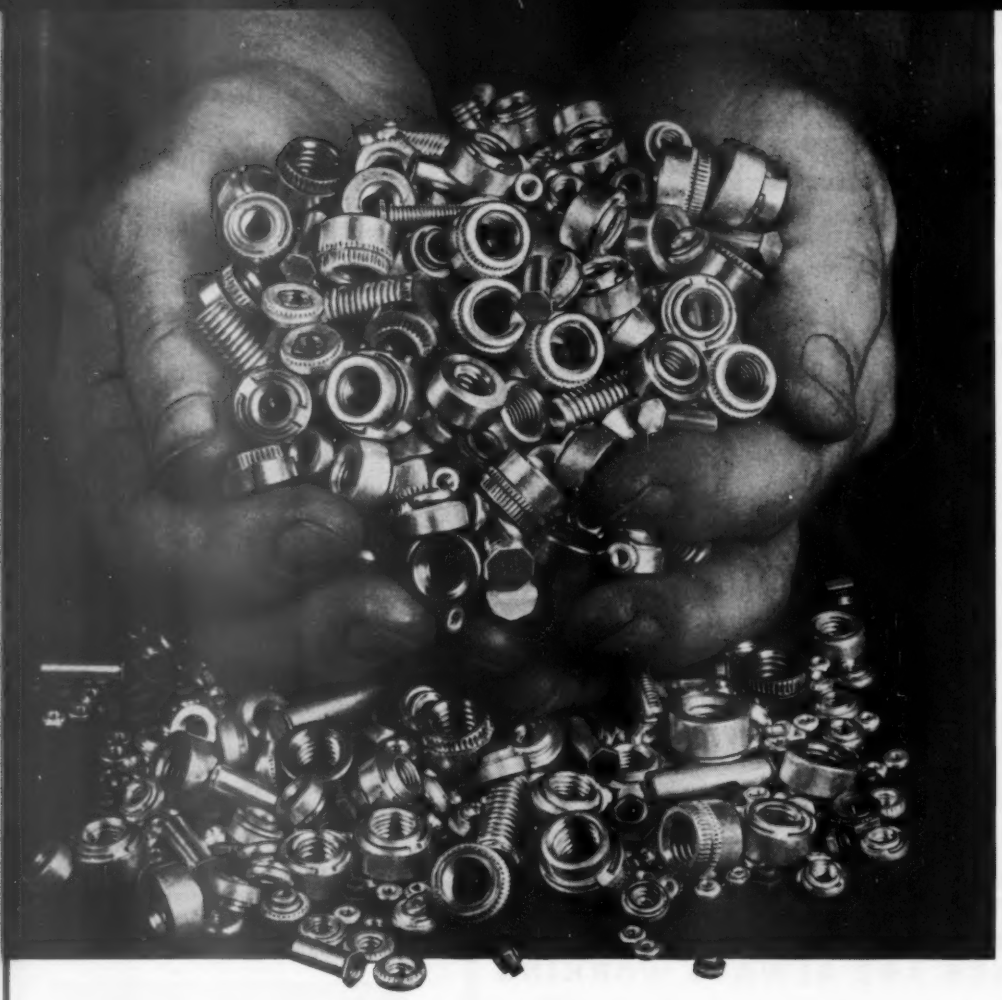
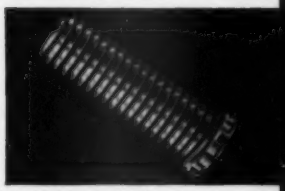


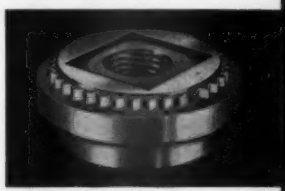
SELF-CLINCHING
FASTENER

SELF-CLINCHING
SELF-LOCKING NUT



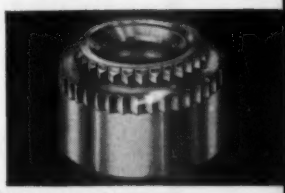
SELF-CLINCHING
CAPTIVE STUD

SELF-CLINCHING
FLUSH FASTENER



SELF-CLINCHING
FLOATING NUT

SELF-CLINCHING
STAND-OFF



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PEM self-clinching Fasteners—for every conceivable need—can serve 95% of your requirements. Can save more than that in use.

They are simply "clinched with a squeeze with the greatest of ease" to secure them into previously prepared holes.

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The bath, called Tufftriding, was developed in Germany and has been under development in the U.S. for the past year. It is particularly applicable to the up-grading of the most common ferrous metals, such as carbon steels, low alloy steels, ductile and gray iron.

Although operated at temperatures from 1000° to 1050° F, Tufftriding will produce the increased properties in a matter of minutes, as compared to hours with gas-nitriding.

It is not directly comparable with "cyaniding" although cyanates and cyanides are used in the bath.

The process, Erler reported, should be investigated not only for gears, but also for other machine parts where improvement in physical properties is desired.

LOCKNUTS MACHINED IN 29% LESS TIME

Locknuts and general screw machine products have been produced faster using Uniloy 303MA stainless steel, as compared with AISI Type 303. The nuts produced also had a better surface finish.

Locknuts machined with Uniloy 303MA being checked for close machine tolerances. Free machining alloy permitted faster production of the locknuts.

The faster machining characteristics of Uniloy 303MA, made by Universal-Cyclops Steel Corp., were proved in a test made by Klincher Locknut Co., Inc., Indianapolis, Ind.

The test was made using 1500 nut blanks each of 303 and 303MA, machined on a multiple spindle screw machine.

The type 303 blanks were machined in 28 seconds each, while the 303MA blanks permitted a reduction in the machining time to 20 seconds, resulting in a 29% saving in machining time per piece.

if you operate cold headers

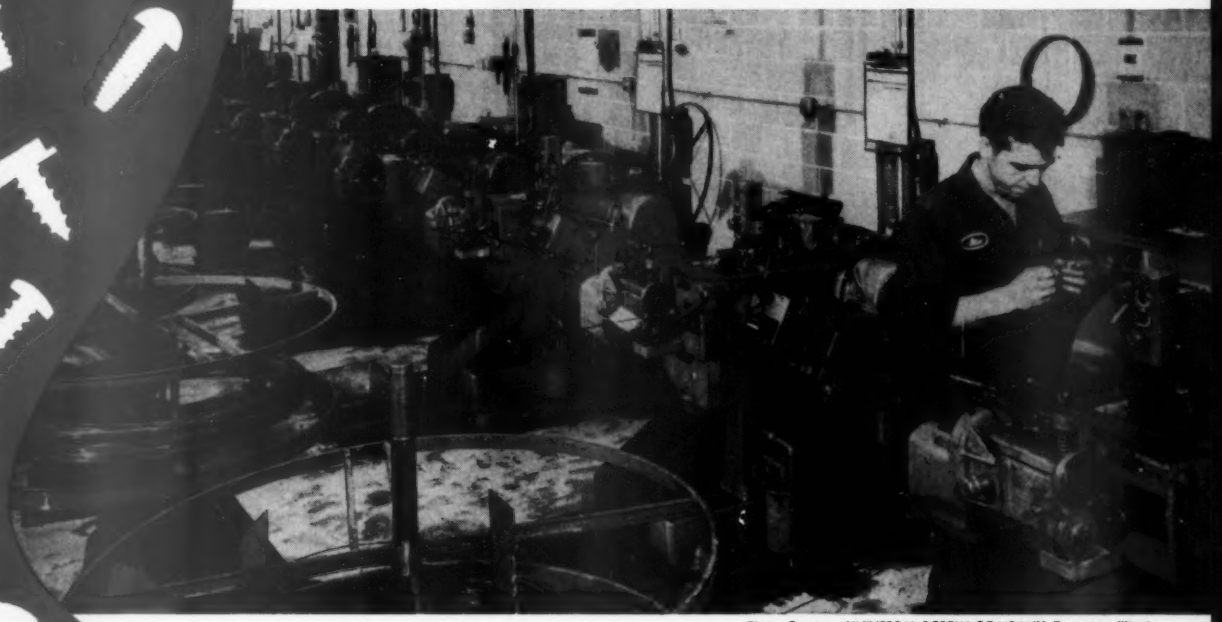

Photo Courtesy UNIVERSAL SCREW COMPANY, Evanston, Illinois

EXTRUDOIL #51 DO Concentrate is for you...

If you're interested in RESULTS, not just promises, you owe it to yourself to find out why Macco Extrudoil #51 DO Concentrate is *THE LUBRICANT* for cold heading. In plant after plant, throughout the fastener industry, it is being used, every day, for high volume, high quality production. REASON? Experience has dictated that Macco Extrudoil #51 DO Concentrate is the one lubricant that does the job best! It's that simple. Get all the facts and a trial from your Macco engineer. You'll see the many advantages other fastener manufacturers are now enjoying.

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How Riveting S

After placing a clip over the guide pin, operator is about to position a phenolic stator section and then cycle the rivet-setting machine. Up to 12 clips may be attached to a stator section.

This article was prepared under the auspices of the Tubular and Split Rivet Council.

In-line riveting of miniature switch assemblies at Centralab Electronics Division of Globe Union comprises eight automatic rivet-setting machines divided into two sections of four each. Rivets are fed to the work automatically from rotary hopper feeds which are integral with each rivet-setting machine.

Solved Assembly Problems for Sub-Miniature Switches

Miniaturization frequently ushers in new assembly problems; parts are more difficult to handle and thus susceptible to damage; dimensional tolerances assume greater importance. Here is how one company, faced with many such problems, found the answer in semitubular rivets.

Among the electronic components made at the Villard plant of the Centralab Electronics Division of Globe Union, Inc., Milwaukee, Wisconsin, is a subminiature, multiple contact switch. Classified as the Series 100, it functions as well as heavier and larger types, weighs less than one ounce, and measures slightly more than a dime.

Usage ranges from guided missiles, through transistor circuitry and aircraft instrumentation to band switching in ultra small electronic equipment. Design prerequisites therefore are detailed and varied. A maximum of four sections can be mounted on a single ⅛ inch diameter shaft, each with index configurations for single pole up to and including four pole circuitry. The number of positions per section range from a maximum of 12 on single pole to two for four pole design.

Physically, each switch consists of one or more sections, accompanying rotors and contact rings, a series of clips, and a shaft, bushings and mounting hardware. Of these, the stator sections, the clips and the contact ring influence assembly rates most drastically.

The materials for the switch—particularly the stator sections—measurably influence its quality. There are two types: In one, a high grade Steatite ceramic is used for rotors and stators; in the other, phenolic laminations have preference.

Ceramic offers better insulating properties than phenolic and usually is specified for severe applications.

Sizes are similar but not identical. In diameter both types are the same, but in thickness a ceramic stator section measures .125 inches versus .0625 for a phenolic type. Both have identical hole patterns since these are set by switching specifications.

Small clips, actually switching positions, attach to the periphery of each stator section. Each measures about 3/32 inches in width and 9/32 inches in length, attaches around the stator rim on one face. They number as many as 12. Clip material is usually silverplated brass.

The stator section has a preformed hole .046/.048 inch in diameter to attach clips. These are locked on a common bolt circle of .8125 inch diameter along with holes for both space and mounting bolts.

The hole pattern for the subminiature rotor (one hole per stator section) is similar to that of the stator but sizes are even smaller. The bolt circle diameter is .280 inch; the hole diameter is .030/.033 inch. For reasons of standardization, twelve holes are provided regardless of the switching specifications.

A flat silver-plated brass contact ring—or segments of a ring—mounts on one face of the rotor. Symmetry is interrupted by small projections around its arc or circumference that contact the clips and complete the various switching circuits. The fasteners holding the contact to the rotor also hold a phenolic disc to the opposite face of the rotor. This disc, in conjunction with the projections on the contact, affixes the rotor in the stator section so that it will rotate but not move off its axis.

During the design stage of the Series 100, Centralab engineers faced up to the task of assembling these miniaturized parts with some semblance of efficiency. Preferably, because of sizes and foreseeable difficulties in orienting parts, they wanted a fastener that could be fed

continued

Location of rivet release mechanism on the feed track in respect to the upper jaw of rivet-setting machine is critical. Rivets for this operation are very small and have little weight. Each must be carried from its point of release, around the curvature of the track, and into jaws of machine by its own momentum.

Riveting a contact, rotor and phenolic disc in a stator section of a Series 100 switch requires at least three and frequently as many as 12 semitubular rivets measuring .027/.029 inches in shank diameter. These must be set on a bolt circle measuring .280 inches in diameter. The small sizes and the setting pressures involved require high strength anvil guide pins.

to the work automatically and at high speed. Secondly, it had to be applicable to ceramic materials.

An investigation of possible methods resulted in favor of small tubular rivets. Inexpensive, they can be set in high speed automatic rivet setting machines. They provide good joint quality and are available in a wide assortment of sizes and materials. Furthermore, riveting requires little technical training; after a brief period for orientation, operators become quite dexterous and proficient.

Being the least expensive type of small rivets and having reasonably good resistance to torque, semitubular rivets are used to assemble the rotor and stator components. Those for the clips have a .043/.045 inch shank diameter. Those for joining the contact and phenolic disc to the rotor have a .027/.029 inch shank diameter. Shank lengths correspond to the material thickness in the stator section plus a precalculated clinch allowance and are held to a tolerance of $\pm$ .003 inches. Rivet material is brass-plated to conform to operating conditions.

There are eight bench-mounted, automatic setting machines of the electro-mechanical type assigned to the Series 100 assembly department. All are installed in line; all are single-spindle. With the exception of tooling and fixturing which classify the machines for riveting clips or contacts, all are identical.

Basically, the machines are standard units with refinements added to (1) minimize parts orientation time, (2) insure an exact clinch, (3) give proper feeding action, and (4) reduce abrasion caused by the ceramic materials.

Reflecting these criteria are:

- A relocated rivet retaining blade assembly on the raceway of the hopper-type feed mechanism. Coordinated with the machine cycle by means of a solenoid, this unit is positioned so that the momentum of each rivet as it is released in the track carries it to the jaws of the plunger. The magnitude of this problem can be better appreciated by considering that rivets for phenolic-type rotors measure .027 inch diameter, .140 inch long, and number about 1750 per ounce.

- A special setting between the tracks of the rivet race, determined

in respect to its curvature and to the weight and shank diameter of the rivet. If this race is too wide, rivets will fall out; if it is too close, rivets bind at the curvature.

• Anvil guide pins made of high speed drill rod and tapered on the end. The geometry of the taper is calculated to reduce abrasion, withstand repeated impact, and produce the proper amount of curl when clinching.

• A lower anvil assembly that has an adjustable spring compensator to absorb impact and remove the risk of breaking ceramic parts.

• A polished steel plate with about ¾ inch diameter and ⅜ inch thick that serves as the stripper pad for machines used to rivet contacts to rotors. The anvil is designed and installed so that the lower point of the taper on the guide pin, when the latter is depressed, is .002/.003 inch above the top face of the anvil. This is critical in producing the necessary clinch repetitively and in reducing wear on the anvil.

• Basic fixturing arrangements, consisting of (1) a steel peg to engage and align the stripper pad and anvil guide pin with the plunger of each riveting machine used to assemble contacts and rotors and (2) a supporting and leveling device on the clip riveting machine.

RIVETING TECHNIQUES

At the start of each production run, riveting machine operators are given a prototype subassembly to follow. From this they determine how many clips must be riveted to a stator section and where these clips are to be located. The type of contact—whether a full ring or a segment—and its relative position on the face of the rotor is determined in a similar manner.

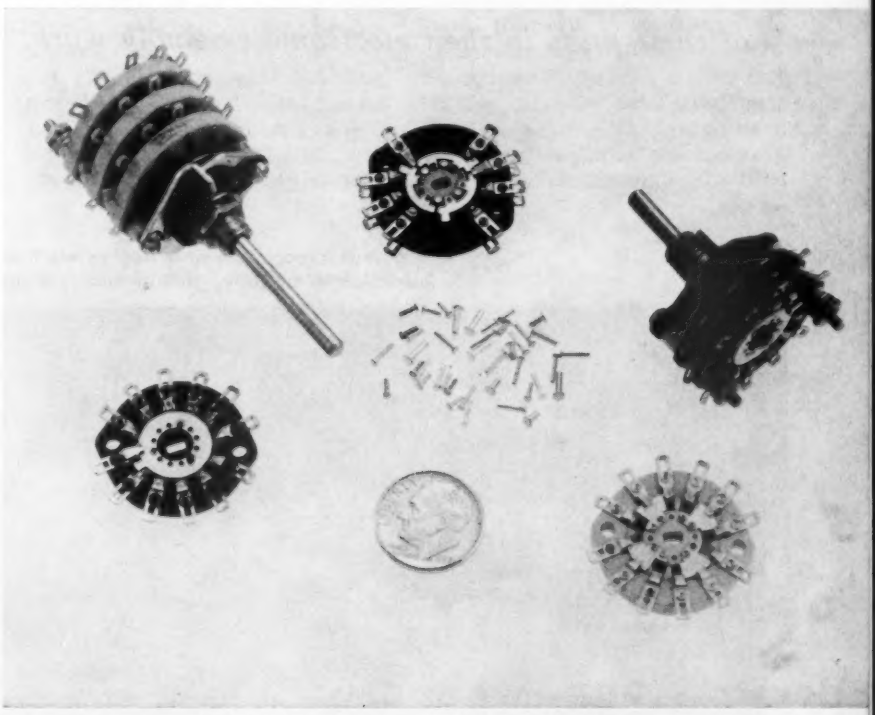
To rivet the rotor, the contact and the phenolic disc together, the operator first hangs the contact on the anvil guide pin, then adds the rotor which is temporarily held in the stator core by finger. The phenolic disc next is placed over the guide pin and the machine is cycled by depressing a foot pedal. Subsequent rivets—at least two and often more, depending on the contact design—are set the same way. Holes in the parts are aligned by pivoting the contact. This procedure demonstrates why the spring adjustment in the anvil assembly and hence the degree of clinch tightness is so necessary.

Although this subassembly involves small parts and close rivet spacings, operators become quite adept in the techniques. For example, in riveting together a rotor, a contact ring comprised of two segments each having two rivet holes, and a phenolic retainer, operators often average 100 units per hour.

Once the rotor and contact are joined and located in the stator section, the partial assembly goes to the second line of four setting machines where clips are riveted, one at a time, to the outer edge of the stator. At least one terminal clip is slightly longer than the others. The operator rivets it in place first using it as a reference point. Then, feeding clips to the anvil with one hand and rotating the stator under the spindle of the machine with the other, she sets the remainder as indicated on the sample part.

Subminiature switches account for many—but by no means all—of the riveting operations in the Centralab plant. There is an 18-position power switch, for example, that requires extensive clip assembly. Being much larger dimensionally, this series is riveted on a different and bigger setting machine equipped with a hydraulic compensated anvil.

Maintenance personnel at the plant have an important role in assembly operations, especially in ceramic lines. An active program aimed at preventing excessive wearing of equipment, maintaining proper spring settings and replacing anvils and pins before they cause trouble has been set up and is followed rigidly. The results—a quality product and high assembly rates—are indicative of its success. •



Various parts of Series 100 switches. Lower left: a phenolic stator section with a phenolic rotor; the contact in this case is a full ring held to the rotor by three semitubular rivets. Lower right: a ceramic Steatite section with the contact composed of four segments each riveted in two places. Top center: a special laminated stator with insulated clips has two phenolic stampings separated by a phenolic spacer; riveting sequence for this is special since clips on the front and back must be insulated. Top left: a three-section ceramic switch with 12 positions. Top right: a two-section phenolic switch with a full ring contact.

How Hughes Prepares

by **Philson L. Ahn**
Manager, Videosonic Systems
Hughes Aircraft Company

A pioneer in the field of modular assembly work stations utilizing audio-visual instruction, Hughes now uses approximately one thousand of these units in their electronic assembly work.

THE potential value of a new process or technique usually depends upon how well it can be integrated and correlated with other procedures with which it must be used. Few such developments will stand by themselves, and in the end become just another step in the progress of production from blueprint to the finished product. Engineering a process or technique that won't fit in this general production pattern is somewhat like engineering a short stretch of highway that doesn't match with other highways at either end.

This fact was held firmly in mind by Hughes engineers during design and developmental work on their Videosonic assembly systems. It was considered from the first that some method of audio-visual instructions

In a soundproof room at a Hughes electronics plant, an engineer dictates assembly instruction to the tape, while another person monitors the playback.

and Uses Audio-Visual Assembly Instructions

would be vastly helpful in the complex production, assembly, inspection and testing operations being accomplished in various Hughes plants. But it was just as evident that more than a machine that would play tapes and flash color slides on a screen was necessary for best results. A concrete and workable method for getting the information onto the tape and for making the color slides would have to be worked out, and facilities would have to be provided so that personnel could use the audio-visual information to the greatest advantage.

Realization of these facts lead to three concurrent developments—the Videosonic unit itself, a system for getting the information onto the tape in its most usable form and for making the necessary color slides, and a series of modular work stations at which the audio-visual information could be most effectively used. As used today on the Hughes assembly lines, these three developments are so closely associated that lines of demarcation are virtually non-existent. Each one is totally dependent on the other two for the high degree of efficiency obtained.

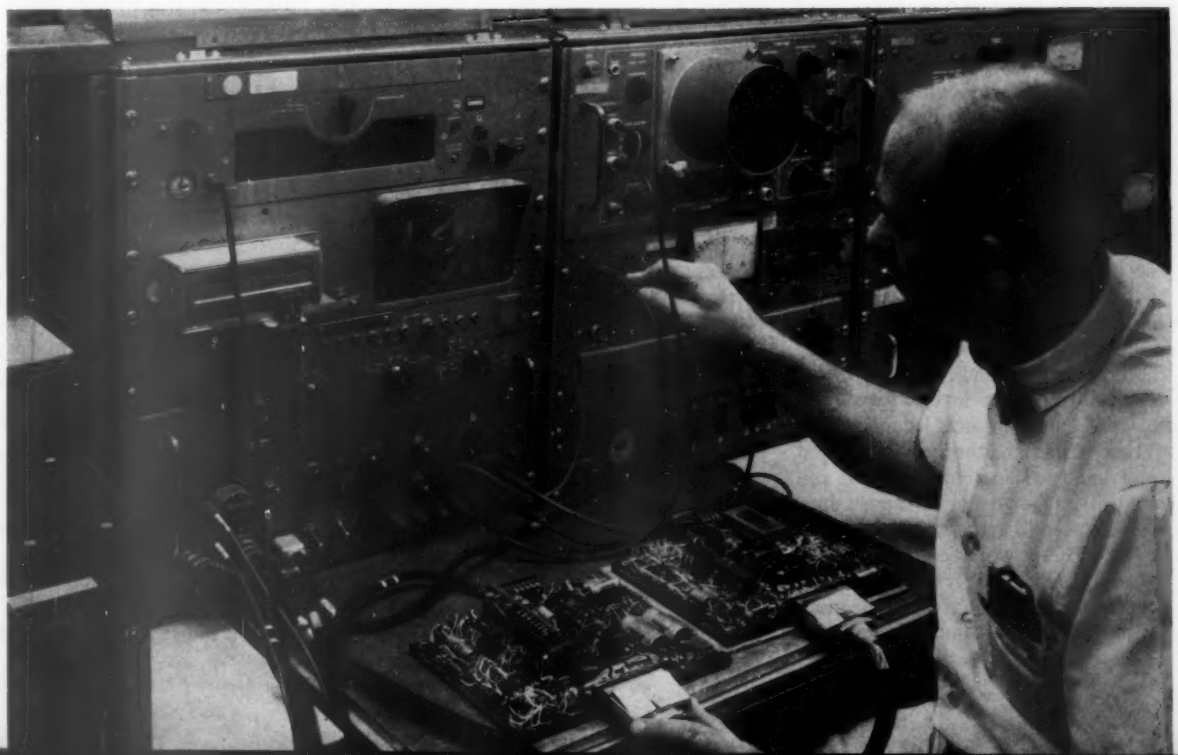
Approximately one thousand of these modular work stations utilizing audio-visual assembly instructions are currently in use in the various electronic assembly plants of Hughes Aircraft.

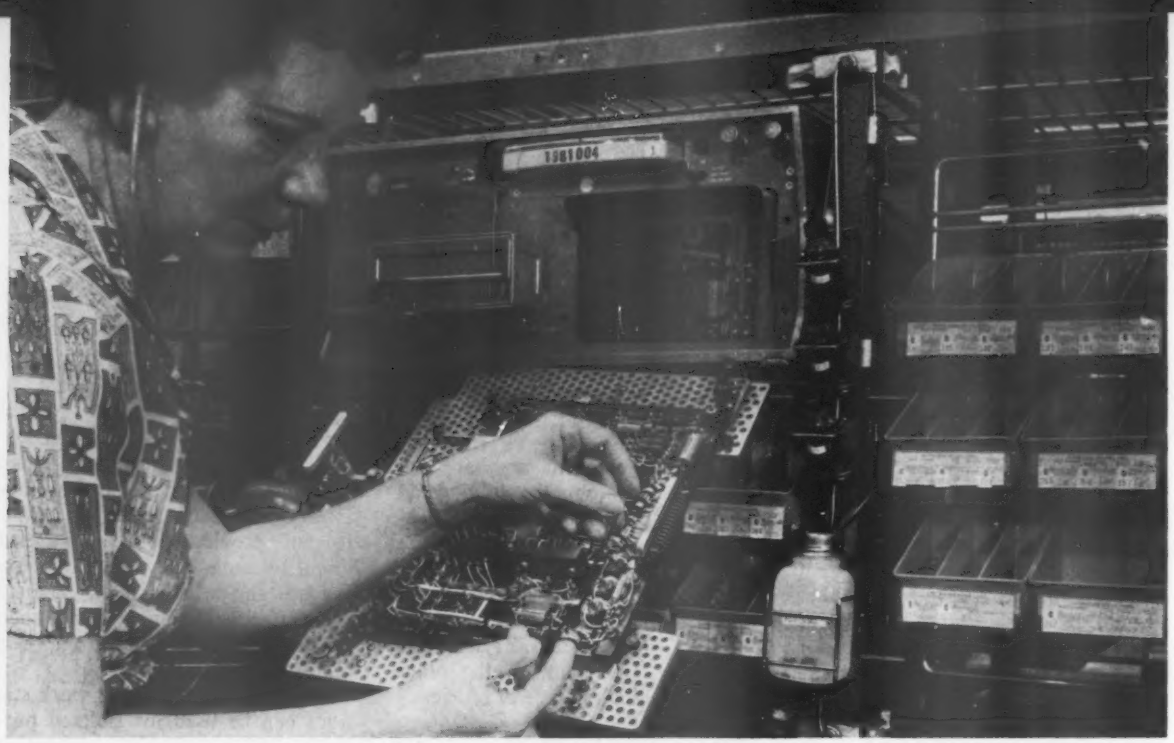
It should be pointed out here that the audio-visual units can be and are used for many and various isolated operations—all the way from employee training to product display for sales purposes. When used in this way, the unit becomes a very convenient entity in itself. It can provide both audio and visual information when and where needed, and in a carefully planned and effective manner. But such isolated uses are aside from their use on assembly lines.

Similarily, the modular work stations can be used for isolated purposes and wherever convenient working facilities are required. These stations can be set up for individual or line assembly. They have numerous interchangeable components which fit them to specific requirements. Such components include stationary and rotating parts trays, adjustable shelving, hand tools, soldering irons, and accessory holders, standard mounting facilities

continued

Here, audio-visual instructions are followed in checking out an operating unit.





Close-up of an assembly station showing Videosonic in use. Wilton work positioner permits the worker to swivel the work-piece to any desired working position.

for test instruments, work positioners, etc.

The system which actually ties the audio-visual units and the modular work stations together into what might be termed "a total and highly efficient work environment" is the system used at Hughes for programming the tapes which provide the audio information and for making the color slides which provide the visual information. In this programming operation, the advantageous facilities of the modular work stations are considered along with the mechanics of audio-visual presentation in achieving the desired results. At the same time human psychology, habits and satisfaction are given full consideration. A follow-through on how a specific assembly or product is pre-programmed will illustrate how this is achieved.

When a product is scheduled for audio-visual assembly, a full set of engineering blueprints is forwarded to the programming department. These prints are thoroughly studied and analyzed so that the work can be broken down and arranged into elements of manageable proportions. These work elements (generally a subassembly, or the build-up of subassemblies into a more comprehensive assembly) usually involve an hour or less of work. Thus all the information pertinent to that specific job can be put on one tape which will run one hour, and confined to 36 color slides which constitute one slide carton. If necessary, a job can be programmed using several tapes and several slide cartons, but this is avoided when possible.

After the total job has been broken down into manageable work elements, each element is further analyzed and broken down into the specific operations which lead to its completion. These operations are then arranged in the order of their accomplishment, and verbal instructions written for each operation.

During this final breakdown and writing of instructions, each part to be assembled is given a simplified call-out number to replace its more complex part number. These simplified part numbers are assigned in the order in which the parts will be assembled. Thus the first part to be installed may be called P-1, the second P-2, etc. Even small standard parts such as nuts, bolts, sheet metal screws, etc., are given a simplified part number corresponding to the order in which they will be used.

This assignment of simplified parts numbers has several advantages. First, it sharply reduces the chance of error in selecting the part to be assembled as it is much easier to recognize than a more complex number. Secondly, the simplified parts numbers make it possible to select modular parts storage facilities for each work station which will store the parts in the order used. Thus the first tray will hold a P-1, the second tray a P-2, etc. Once again this arrangement minimizes the chance of assembly error; reaching for the right part becomes almost an automatic movement.

After the text of the audio instructions has been written, arranged in order of accomplishment, and simplified parts numbers assigned, the time required to accomplish each operation is carefully estimated. When dictating the text to the tape, the estimated time for each instruction is allowed to elapse before the next instruction is dictated. Thus, when an assembler is working at normal speed, the audio-visual machine operates steadily with no need for shutoff or a re-wind and re-play of instructions which were prematurely given.

With the audio instructions prepared, the next step is the production of color slides which will illus-

Two assemblers using audio-visual instruction while working together on a complex assembly.

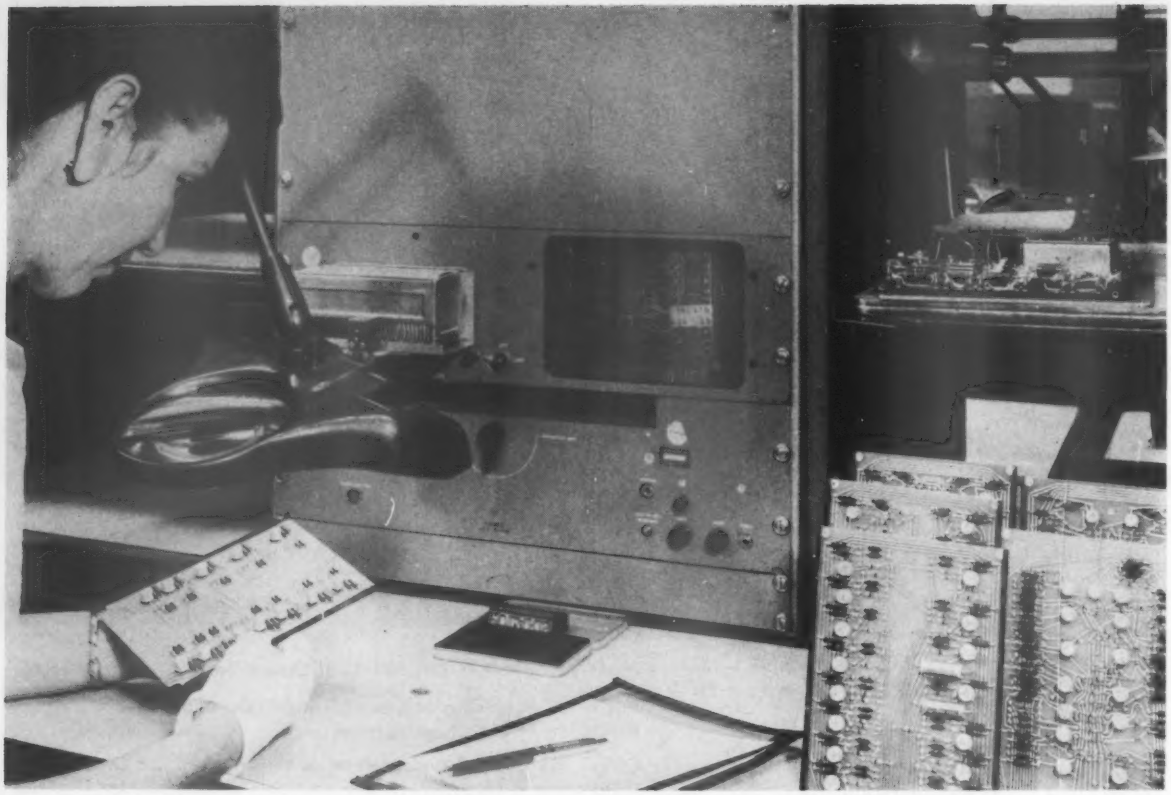
trate each operation. After ascertaining how a specific operation can be best illustrated, a set-up for the photo is made. But before the actual photography is accomplished, representatives of Quality Control are called in to view the set-up. The question is asked—"Will Quality Control accept this work if accomplished in the manner shown by this set-up?" Thus their approval is obtained before the photo is made. Subsequently, the identification number of the person approving the setup is attached to the slide so that it is projected on the viewing screen during actual assembly of the part.

With the tape made and the photo slides ready, the audio-visual "package" is ready for use on the assembly line. But note carefuly what has happened during this programming operation. First, the total job has been broken down into convenient, easy-to-handle, and comprehensible work units. Secondly, these work units have been arranged in the logical order of their achievement. Third, each part has been assigned

continued

Reproduced at right are typical portions of manuscript developed during programming of a part for assembly.

	Description of Operation	*Minutes*
	This is the beginning of assembly instructions for the A-106616 Low Voltage rectifier:	
Frame 1:	Obtain P-1 and P-2 and position as shown.	0.25
	Obtain four P-3's and P-4's and assemble chassis	1.40
Frame 2:	Obtain P-6 kit and remove parts; obtain P-7 and two each P-8, P-9 and P-10; attach transistor to chassis.	2.50
Frame 5:	Note: peripheral terminals on capacitors are negative; center lugs are positive. Route wires to closest negative terminals	
	Obtain, wrap, cut, and crimp following point-to-point wires:	
	W-1 positive "A" to negative "B"	0.75
	W-1 positive "B" to negative "C"	1.00
	W-1 positive "C" to negative "F"	1.00
	W-2 positive "D" to negative "A"	0.50
	W-3 negative "D" to negative "H"	1.00
	W-4 positive "H" to negative "B"	1.00
	W-5 positive "I" to negative "H"	0.75
	Obtain W-5, strip additional ⅜" insulation wrap from terminal 8 to 9 on "G" socket. Wrap to negative terminal on "H" capacitor.	0.90
Frame 9:	Obtain P-23 harness; insert in chassis as shown.	0.75
	Wrap, cut, crimp and solder the following wires:	
	W-G to positive terminal "A"	1.00
	W-O to positive terminal "B"	0.75
	BK to top negative terminal "D"	0.75
	W-BL to positive terminal "D"	0.75
	O-R to top negative terminal "E"	0.75
	W-P to positive terminal "E"	0.75
	S-R to left negative terminal "F"	0.75
	W-R to positive terminal "F"	0.75
	BR and S-Y to terminal 1 on "G" socket	0.60
	W-BL to terminal 3 on "G" socket	0.60
	Y-R to terminal 6 on "G" socket	0.85
	BK to terminal 9 on "G" socket	0.60
	W-Y to left negative terminal "I"	0.60
	BK to positive terminal "I"	0.60
Frame 11:	Obtain two P-25 screws and attach board to chassis.	1.10
	Clean soldered contacts.	2.00



Videosonic is used here for the inspection of printed circuit assemblies.

a simplified parts number which not only simplifies its recognition, but makes it possible to select modular work station elements so that the parts can be assembly-line stored in the sequence of their use. Fourth, each operation as illustrated by the color slides, has already been approved by Quality Control. Fifth, time standards for the individual elements and for the total assembly operation have been established. Sixth, the need for numerous assembly drawings and printed instruction sheets has been entirely eliminated.

Seventh, and most important, the assembly worker has only to load the audio and visual information into the machine and go to work. The parts he needs will be on hand and stored sequentially in a "short reach" position in an appropriate modular storage rack or tray. The tools required will be on hand and stored in another "short reach" position in a tool holder specifically designed for ease of tool removal and replacement.

Though time standards are established for each operation, these standards are intended more for convenience than for controlling worker speed. These standards actually "stretch out" delivery of the audio information and appearance of the slides so that they coincide with normal working speed. Thus it is not necessary to stop the machine after each information delivery then start it again for the next. If, however, an unexpected problem or situation comes up, the machine can be stopped and started at will. The tape can be rewound for a repeat of audio information, or can be run "fast forward" when searching for a specific bit of information.

With the Hughes audio-visual systems, background music plays during the delay between the finish of one audio instruction and delivery of the next. This has been found beneficial to worker morale, though he is at liberty to "shut off" the music source if he so desires.

Application of the combination audio-visual and modular work station system at Hughes in many diverse assembly departments makes specific cost and time saving figures rather meaningless as such would apply to one operation only. But taken as a whole, and applied to assembly operations in general, here are some interesting results:

Assembly defects per hour have been reduced from 40 to 55%. In one assembly operation, defects per assembly were reduced from an average 35 to an average of one!

Productivity, dependent upon the application, has been improved from 30 to 50%.

The learning cycle for new starts (or transfer personnel) has been noticeably reduced in all applications, and in some applications has been reduced to one-tenth the time formerly required.

In all cases, due to improved and more convenient work station arrangements, and to the ease of receiving and assimilating audio-visual information, operator tension and fatigue has been relieved. ●

Coils are inserted in stator cores at Scot under general lighting system supplemented by a local incandescent system.

BETTER QUALITY WORK, HIGHER EFFICIENCY WITH NEW LIGHTING

Higher quality work, greater department efficiency, plus improved worker comfort and less fatigue—all because assembly operations were moved into a better lighted area. That's the experience of Scot Inc., Downers Grove, Ill., producers of coils and other equipment for servo-motors, synchro-motors and other electrical apparatus.

Thanks to new lighting system, headaches are gone for girls doing fine electrical wiring on this assembly line. General overhead lighting system features fluorescent lamps in diamond pattern.

"Under our former lighting system we had only 50 to 75 footcandles," reports Glen F. Graham, president. "Today, we will maintain 200 footcandles, and right now have 230."

Maurice Jacobs, vice president of the Scot electrical division, put it this way, "It seemed that we used to give away aspirin by the barrel, while now we hardly give away any! Indeed, our assembly girls are experiencing far greater comfort, less fatigue, and production quality and efficiency is benefiting."

Assembly operations at Scot require fine wire winding, inserting, tying down, forming and other operations to produce rotors and stators. The 200-plus footcandle general lighting system is supplemented with small directional lights at critical operations so that up to 750 foot candles may be obtained for fine work with size 45 magnet wire.

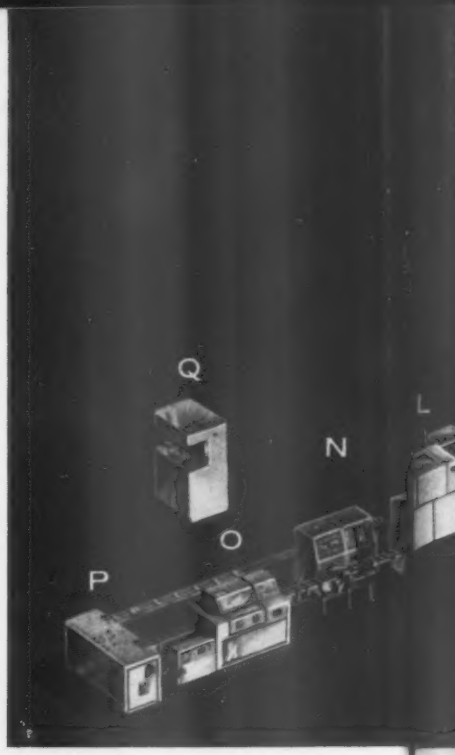
Before moving to the new assembly area, Ben Avery, a General Electric lighting engineer was called in to help plan the new lighting system which utilizes "power groove" fluorescent lamps.

Careful attention was given to every visual detail. For instance, sun glare problems were reduced with frosted and coated windows.

Contrast was another problem. Contrary to normal recommended practices of using a light colored high-reflectance work surface, Scot uses darker felt surfaces for many key tasks. The reason? The contrast between the enamel coated wire and the stripped wire ends which shine out against the dark background simplifies the connecting and soldering operation.

In addition, Glen Graham designed a diamond pattern for fixture mounting to help reduce shadowing to a bare minimum. This gives the benefit of some cross-shielding from any direction. •

A general purpose digital computer controls automated assembly line at Western Electric's North Carolina Works. Special input and output circuits were developed to enable computer to do its job of programming, setup and feedback control of individual machines in the line.



This block-long array of interconnected robots turns out deposited carbon resistors which must meet severe electrical requirements.

COMPUTER - CONTROLLED RESISTOR ASSEMBLY LINE

A completely computer-controlled process for making deposited carbon resistors has been unveiled by the Western Electric Company at their Winston-Salem, North Carolina Works. The block-long array of inter-connected robots is believed to constitute the first completely automated process for the assembly of a discrete electronic component. Maximum production is 1200 finished resistors per hour.

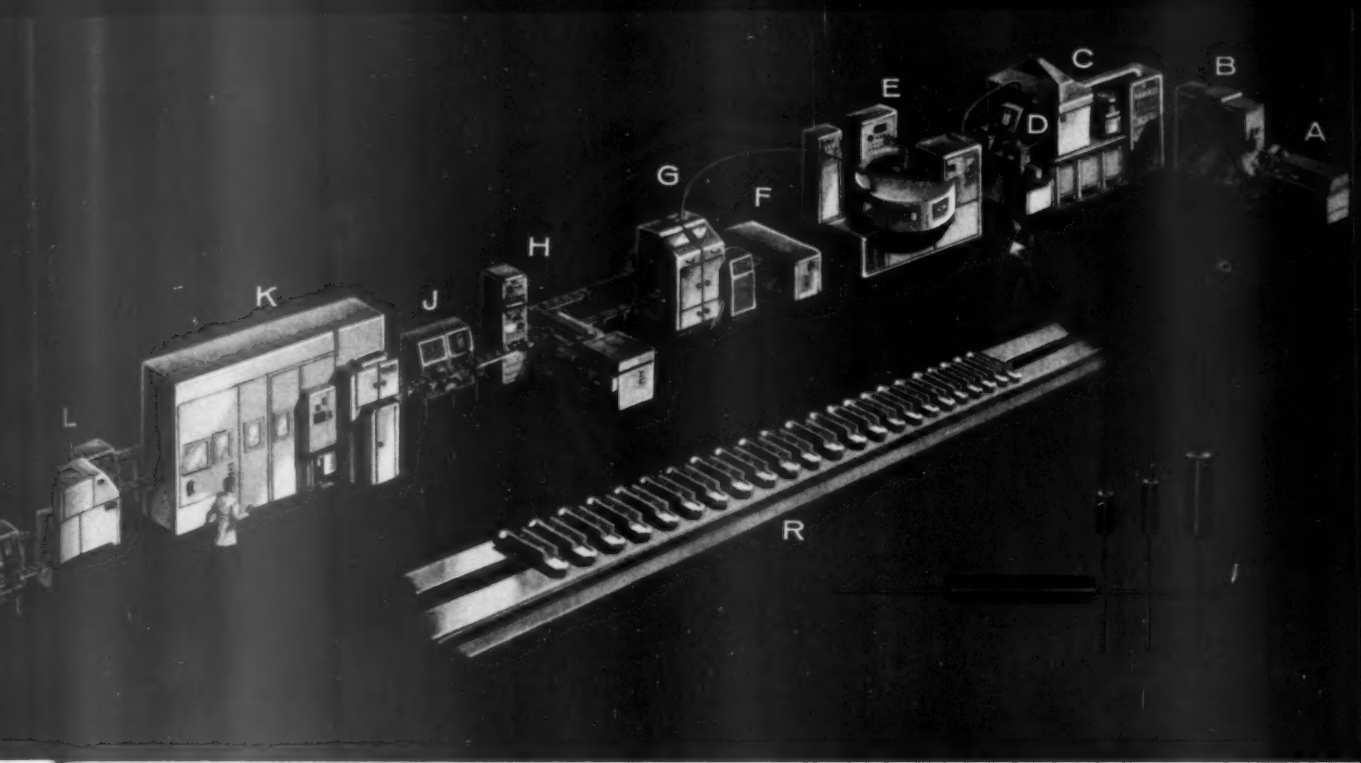
In addition to controlling step-by-step details of assembly, the computer can accept a production schedule for a full month's output and thereafter automatically issue detailed instructions to make and package any or all of four basic power sizes of resistors in such quantities and resistance values as desired. When information is fed into the computer to change from one basic resistor to another, all tooling is automatically adjusted to handle the change in production.

Western Electric decided to develop the automated assembly line when a survey indicated a considerable increase in total resistor usage, with a definite trend toward the deposited carbon type, and a severe need for greater reliability in resistors.

How their development engineers met this challenge is better understood by following a resistor through the line step by step. First, however, it is necessary to know something about the real brains of the line—the control equipment.

The heart of the control equipment is a digital computer with a 4096 word magnetic drum memory. It was redesigned extensively, adding the input and output circuits required for it to control the programming, setup and feedback control of individual machines. Basically, the computer performs in three areas:

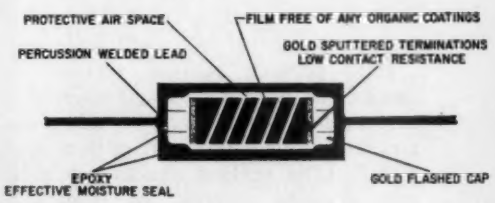
1. It programs production control. A month's requirements can be fed into it at random.



LEGEND

A. Computer
B. Output-input control station
C. Coating station
D. First inspection station
E. Terminating station
F. Conveyor control equipment
G. Capping station
H. Helixing station
J. Second inspection station
K. Encapsulating station
L. Leak detector station
M. Marking station
N. Third inspection station
O. Packing station
P. Conveyor control equipment
Q. Cap-lead welding machine
R. Detail of conveyor line

EPOXY ENCAPSULATED RESISTOR


PROTECTIVE AIR SPACE
FILM FREE OF ANY ORGANIC COATINGS
PERCUSSION WELDED LEAD
GOLD SPUTTERED TERMINATIONS LOW CONTACT RESISTANCE
EPOXY EFFECTIVE MOISTURE SEAL
GOLD FLASHED CAP

2. Using the methods of statistical quality control, it analyzes control data plotted at three critical points in the automated line, and applies statistical tests to determine if a trend is developing.

3. It formulates the information to detect any drift away from the accepted manufacturing tolerances. No action takes place if this analysis indicates normal statistical distribution around a desired nominal.

COATING

The large batch coating method commonly used in industry proved unsuitable for the automated deposition of carbon film. Effective feedback control required a continuous unit-by-unit feed-through process.

A tiny ceramic core is the nucleus of the resistor. It begins its trip through the line at the coating machine where a control device regulates its speed through three separate chambers of a horizontal furnace. Inert nitrogen gas, continually flushed through the deposition area of each chamber, forms a pressure seal against end-baffles. In the heating areas of each chamber, a temperature exceeding 2000°F decomposes methane gas to form crystalling carbon on the core. The core is then cooled to room temperature and sent to an inspection station. The results from this inspection form the basis for feedback control of the furnace.

This station also inserts magnetic slugs as instructed by the computer to separate individual lots of resistors when changes of resistance value or resistor size are called for.

The carbon coated core next goes to a terminating machine which sputters a gold contact over each end. This sputtering lasts for almost a minute, depositing a layer of gold approximately ten millionths of an inch thick. Rotary indexing vacuum chambers are the work horses of this 36-station machine.

CAPPING

The ceramic core is now a resistor. Attach a wire lead to each end and wire it into a circuit, and it will resist the flow of electricity. The capping machine attaches these leads.

The wire leads are first attached to tiny hexagonal caps of gold-plated brass. This is done in an automatic percussion welding machine

continued

outside the line. The cap-lead assemblies are then inserted into the capping machine which feeds them into capping chucks. The resistor core, upon leaving the terminating machine, is loaded onto a turret which holds it in position while the capping chucks simultaneously press the cap-lead assemblies over both ends. The capping force is sufficient to weld the gold plating of the cap to the gold on the ends of the core.

HELIXING (SPIRALLING)

This is where the resistor obtains a precise value. The helixing machine cuts a spiralled groove along the carbon film of the core to obtain the desired resistance. A computer-controlled bridge monitors the cutting which is done by rotating the resistor against a diamond-impregnated wheel. At the next inspection station, any defective resistors are automatically rejected.

ENCAPSULATING

The resistor next feeds into an encapsulating machine. Here, a precured epoxy shell is fitted over the core, and two partially-cured epoxy pellets are inserted over each lead.

Held between resilient rubber chucks, the resistor moves through an oven for approximately 15 minutes in a curing temperature of over 300°F. (The resilient chucks prevent escaping trapped air from causing leaks in the finished resistor.)

The shell, now fully cured, rests on the gold caps of the resistor, retaining an air space along the resistor body to prevent organic contamination of the carbon film. The partially-cured pellets on the leads do soften, forming an effective seal with the shell. The resistors then pass through cooling water jets which terminate the cure of the pellets. Detection circuits within the machine reject any resistors with missing shells or missing pellets.

LEAK DETECTION

Moving along a conveyor from the oven, the resistor moves on to a leak detection machine where it is immersed in a hot water bath containing a wetting agent to prevent surface bubbles from clinging to the resistor body. The heat expands inside the capsule, and a series of ten photoelectric cells watch for air bubbles. The machine can detect leaks as small as 2×10^{6}cc per second.

Last machine in line embeds finished resistors in styrofoam block, then loads blocks into a magazine. Here a filled magazine is unloaded for packaging and shipment. Like others in line, machine is computer-controlled.

A marking machine next stamps on the wattage, resistance value, production lot number and date on the encapsulated resistor. A modified offset printing technique is used. The next and final inspection station—another feedback control point—resets the preceding inspection station to compensate for shifts in resistance value caused by the heat of encapsulation.

Next the resistor moves onto a packing platform where it is pushed into a bank between two loading jaws. When the bank fills, an anvil pushes the pre-positioned resistors into a styrofoam block. The block goes down a hopper into a loading magazine, and is ready for shipment.

CONVEYORS

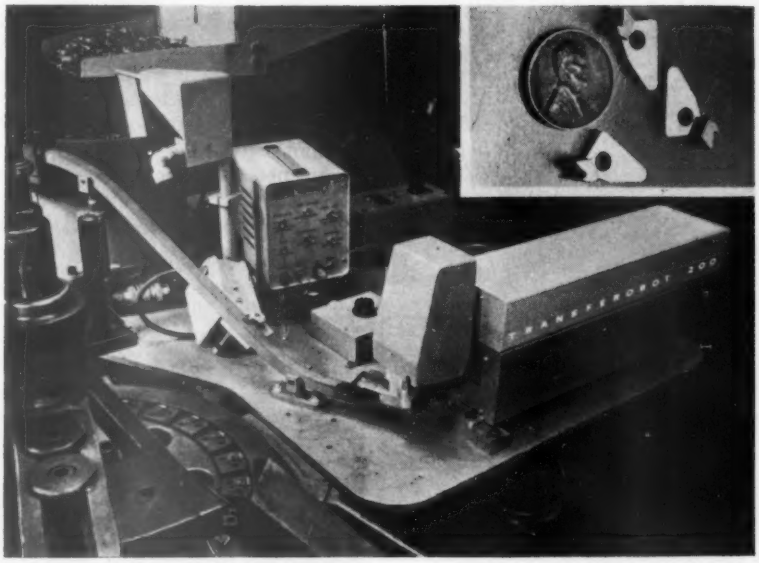
Between the first four stations of the line, the resistor core is transported by being blown through a plastic tube with gentle air pressure. From the capping machine through the succeeding operations, the resistor moves from machine to machine by a conveyor control system. This system uses individual stainless steel pellets which move along continuously-running belts.

CAP-LEAD WELDING

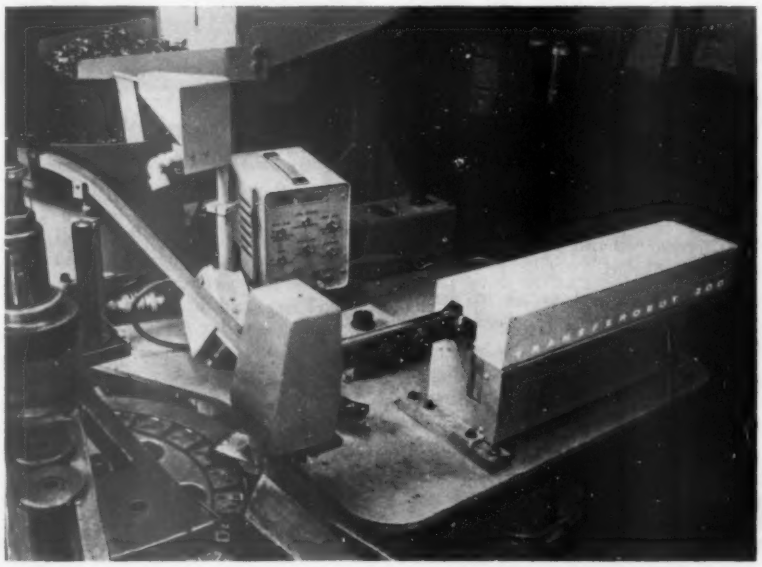
An automatic machine outside the line percussion-welds a solder-coated lead to the gold-flashed brass cap used in the capping operation. The weld is made at the joint of the cap and lead by an extremely short (less than 300 microsecond) arc of high intensity.

The percussion welder's output is approximately 3,600 parts per hour. It has changeable tooling to accommodate three different cap sizes and two wire sizes. Fail-safe features shut off the machine or reject the part in the event that no cap is fed, a lead is not attached, or a poor weld occurs. •

Industrial robot performs operations on command from its own electronic brain



Dexterity of robot device is shown in photo taken at Underwood-Olivetti plant. The device (top) picks up a typewriter part (shown in insert) as it is delivered down chute from parts feeder, then (bottom) transfers part into the nest of countersinking machine.



Industrial robots that can be programmed to do a variety of repetitive assembly tasks are now a reality. Some of these devices are already at work in companies making such varied products as clocks, electric typewriters, and automotive parts. This is less than two years after the first experimental models were announced by U. S. Industries, Inc.*

Known as the TransfeRobot, the machine is a mechanical version of an arm and a many-fingered hand. It is designed to perform operations under the command of its own electronic brain. Edwin F. Shelley, USI vice president and creator of the robot concept, foresees the use of 100,000 such machines by American industry alone over the next few years.

A report on three different types of operations, in which the robots are working full-time, was recently made by John D. Goodell, president of the USI Robodyne Division. These indicate the unit's versatility in not only assembly, but in other manufacturing operations.

At the Westclox plant in LaSalle, Ill., one such unit is incorporated in the assembly line to oil completed clocks as they near the end of the line. The machine oils eight precision bearings simultaneously in one second.

At the Underwood-Olivetti plant in Hartford, Conn., an industrial robot (see photos) picks up, transfers and places a small component for an electric typewriter into a close-fitting nest for a countersinking operation.

In the manufacture of a steering assembly at an automotive plant, a robot feeds partially fabricated parts

continued

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to a trimming press, orders the press to cut off the excess material, and ensures that the finished parts are properly removed from the press.

The robot's versatility stems from the fact that it can be programmed to do different tasks merely by changing the accessories. It uses its fingers to seize, move, position, and relinquish the part it is handling. With the use of an accessory swivel, the machine acquires a "wrist" which enables it to perform virtually any required set of motions within the limits of its reach.

Upon command of its electronic brain, the machine performs its own tasks and can order other companion machines to act as well. If the brain senses that something has gone wrong in the work program, the machine stops and notifies the department supervisor, through flashing lights or buzzers, that an error has to be corrected. •

*See "Look for the Robot on the Assembly Line", page 16, January 1960, Assembly & Fastener Engineering.

Don't blindfold him!

THE AWESOME-looking instrument in the picture above is an electron microscope. Through it, a cancer researcher can observe the detail of a cancer cell—magnified 100,000 times.

The microscope costs $35,000 and was paid for by American Cancer Society funds—which support 1300 scientists, all working to find the cause of cancer, and its prevention.

Don't blindfold cancer research. Give to it. Send your contribution to CANCER, c/o your local post office.

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Technical-ities

By Fred E. Graves

No difference between hex and cap screws

It's not the *name* of a standard fastener that determines whether to use it for a particular application, but vice versa. The *application* requirements for strength and tolerances dictate the fastener.

Thus, if you have a joint that calls for certain tolerances in a screw, obviously the one which satisfies those tolerances is the right fastener.

IDENTICAL STANDARDS

In the case of cap screws and hex screws, the standards will show you that these are merely different names for the same product. They're actually made on the same machines, to identical tolerances, and from identical materials.

No reason then to differentiate. For tapped holes, merely specify Hex Screws (SAE Grade 2) or High Strength Hex Screws (SAE Grade 5), and you'll get the *right* fastener with the quality needed.

For bolted joints, these same items are supplied with nuts when specified.

This should suggest a way you can extend standardization in your plant . . . and benefit from our new simplification of nomenclature which calls *any* fastener with head on one end and threads on the other a *screw;* and a screw plus nut a *bolt.*

See how "holding power" can cut fastener costs

SIZE	SAE GRADE	SAE PROOF LOAD	COST RATIO
3/4"	Gr. 5	28,400 lbs.	100%
1"	Gr. 2	16,950 lbs.	188%
1 1/8"	Gr. 2	21,350 lbs.	239%
1 1/4"	Gr. 2	27,100 lbs.	277%

Since the usual job of a threaded fastener is to hold an assembly tightly together, its *clamping force* is what you're really utilizing. This seems obvious. But how best to get the clamping force needed for the joint design? Not so obvious. Looking at size alone can be misleading . . . *and quite costly,* as the chart above demonstrates.

HOLDING POWER MEANS MORE THAN SIZE

SAE "proof load" of four different hex screws of standard steels, along with typical cost ratios, are compared. Almost unbelievable, isn't it? Yet it's a fact that the smallest of the group—the heat treated SAE Grade 5 *RB&W High Strength Hex Screw* exceeds all the others in load capacity. It can be used in place of any of the others in most normal usages.

Since it's smallest and therefore weighs the least, it also costs less... 64% less than the 1¼-inch grade 2 hex screw; 58% less than the 1⅛-inch; 46% less than the 1-inch. And since holes can be made smaller, there are also the savings in production drilling . . . and possibly in materials, too.

DESIGN ADVANTAGE

Remember, too, that smaller fasteners are more easily torqued to higher preload levels . . . which helps keep joints tight, makes them more vibration-proof.

If you would like to explore this approach to fastener economy and better utilization of "holding power," consult with an RB&W specialist. Let him contribute his fastener knowledge to your design and production needs. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa., Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

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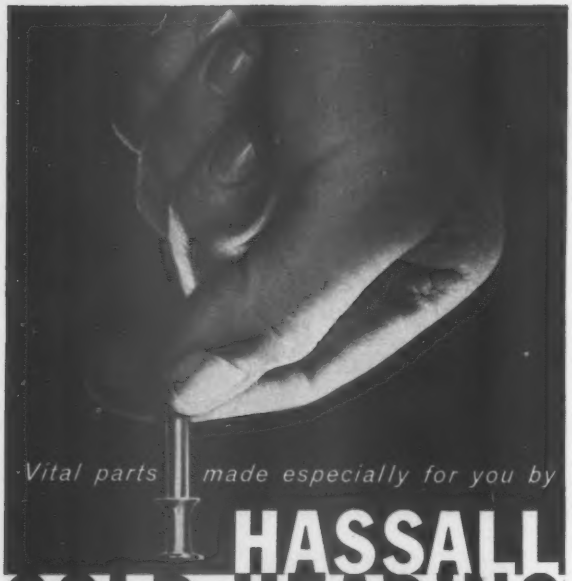

VITAL FASTENERS—rivets, nails, screws, pins; threaded, shouldered, drilled, close tolerance, AN specs, special alloys.

The fastener itself is often a minor part of your assembly cost. If a Hassall Job-Designed rivet can reduce assembly time, meet re-design demands quickly and make joining simpler, lower costs will result.

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The ABC's of power screwdriver bits

by **William A. Klinger**
Field Engineer
The Apex Machine & Tool Co.

There are three ABC's to consider when it comes to selecting the right power screwdriver bits for the right jobs, assuming first of all that the bits are made of shock-resistant steel. These ABC's are the result of years of research and attention as to what makes a bit fail, and what makes a better bit.

A. Proper fitting of the blade to the screw recess. Bits should be milled with a hollow-ground effect, providing for distribution of stresses and longer life. Bits should also have a curved profile. For screws that are plunge-milled, there should be a slight crown on the blade to better fill the slots. If the operator tilts the driver, he still has a substantial part of the blade driving and transmitting power to the job with less burring of slots, less camming out and bit breakage.

Did you ever try to drive a large screw with a wide slot into an undersized pilot hole? If a misfit blade is put into a large slot, there is a good chance that it will be off center. Then, when power is applied, the eccentric motion results in burrs, broken bits, or slipping from the screw to mar the surface of the workpiece.

DETERMINING THE PROPER FIT

Proper fit in a slotted screw means that when you hold the blade in the slot, and turn toward the light so you can sight the length of the slot, you will see very little or no light. The blade should fit from one end of the slot to the other. If the blade is too thick, wet grind it to fit or use a whetstone, but keep it cool. If finder sleeves are needed, use the cup or tapered opening to fit the type of screw, and the proper diameter so the screw neither falls into the hole, nor rides the rim of the finder.

Tool catalogs often refer to 10F and 12R. This means 10 flat or 12 round. Another important dimension is the blade thickness. Then comes the width. Whether bits are made from hex or round stock, they can be only as wide as the stock. The listed body diameter usually designates the width of the blade. In the case of hex inserts, various widths are obtained by breaking the corners to create narrower ends to fit smaller screws.

Some screws have sharp cornered, crossed recesses. The theory is that the sharp-pointed driver will seat itself and can be used to drive different sized screws.

Still other screw recesses have crosses with rounded corners. Blades to fit these corners should have rounded corners and thus more strength. When driving recessed screws, the driver centers itself and power is properly directed; finder sleeves are generally not needed.

B. Now that we have fitted the blade to the recess, we come to the next important point—proper heat treat of the bit to fit the job. Stock numbers in catalogs usually designate regular heat treat for power drivers used to drive machine or wood screws, where stall torque is imparted by the driving tool or where there is no severe ratcheting or hammering as with an impact tool.

Applications are getting tougher and tougher, requiring harder bits with higher Rockwell hardness. One new development, for instance, is a screw that drills its own pilot hole and taps its way into the workpiece. The hardness of the bit should match the hardness of the screw.

C. The third important point is bit wear and breakage. Are the pilot holes the right size? Are the screw slots or recesses properly formed? Sub-standard screws may have poorly formed threads, may be bowed, or may have slightly off-centered slots.

VARIANCE IN SCREW RECESSES

Recesses in some screws are plunge-forged by a male die. If the die wears too much, there will be a shallow recess. The bit cannot fit properly; bits will wear or break excessively. There is an off-standard recess which is shallower than usual and has a flat spot in the bottom. The angles of the sides are more obtuse. The point of the screw rests on this flat and the driving wings are lifted out of proper contact, resulting generally in very short bit life. The answer to this problem is a bit point with a blunt nose and greater angle to the wings, providing a perfect fit in the recess.

Some other common errors are trying to drive No. 0 recesses with No. 1 points, or No. 3 recess screws with a No. 2 bit. One occasionally finds screws with recesses partly filled with wax, paint, or excess plating. This condition prevents a screwdriver bit from seating properly. Also, bits coated with rust preventatives should be degreased before use since this lubrication encourages slipping from the slot.

Long bit life cannot be obtained without proper end pressure on the tool. If a power tool is tilted, not only is bit life reduced, but the driver loses its driving force. Other bad practices to avoid include working in an awkward position, and using a driver improperly suspended or without a balancer.

When blades are breaking, gather together about a half dozen of the screws being driven and return them with the broken bits to the tool supplier or his representative. If possible, let him view the particular operation involved. He can be of great service in solving the problem of bit breakage if he knows: (1) types of driver —stall torque, ratcheting, or impact; (2) torque being used; (3) material screw is being driven into; and (4) whether or not screws are driven at an angle or around an obstruction. •

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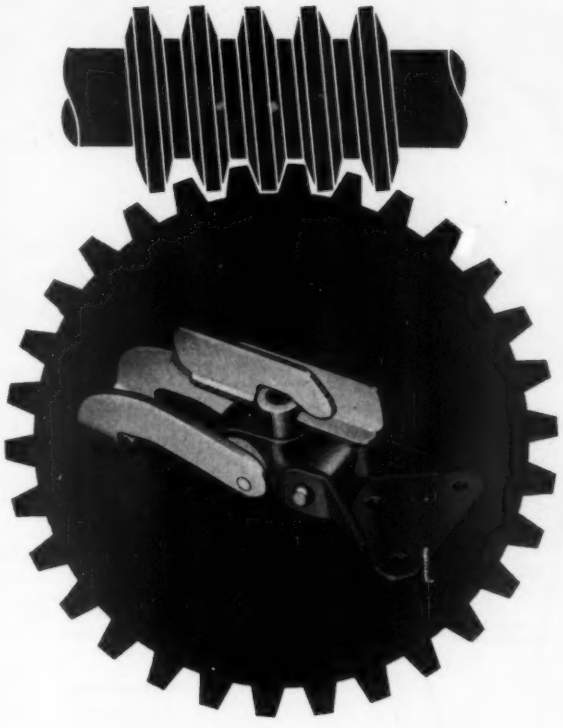

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See our catalog in Sweet's Product Design File

Symbol of SW Excellence — Bassick — A DIVISION OF STEWART-WARNER CORPORATION

Use postpaid card. Circle No. 226

GREAT HISTORICAL LEAKS

BETTER WITH A HEXSEAL*

HEXSEALS are modular external seals. They fit onto switches, potentiometers, circuit breakers and lighted push-buttons.

We also make:

- SEELSKREWS*
- SEELBOLTS*
- SEELRIVITS*
- SEELTHREDS*

} SELF-SEALING HARDWARE

APM PRODUCTS MEET ALL APPLICABLE MIL SPECS.

Our list of modular seals is just too long for this ad. Let us send you our Catalog No. 359B.

*Trade Mark

Write or call:

MISS RIVA SOLINS

APM **A.P.M. Corp.**

41 Honeck Street, Englewood, N. J.

LOwell 9-5700

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AS RUDY SEES IT

Got a question, challenge, puzzle to share or story to tell? Shoot it along, we'd like to meet you.

SPECIALTY OF THE HOUSE

On a recent trip, one of our editors noticed that in Jenkintown, Pa., there is a "Ham" Buerger Electronics Co. We wonder where they buy their "spaghetti."

DEFINITION

A Miracle—An ordinary accomplishment successfully completed by a committee.

RESEARCHING THE BIRDS & BEES

A newspaper article recounting present inventions and foretelling future benefits of research and development states ". . . cross-fertilization produced by increased research effort should shorten the time needed for development of many new ideas, and thus will multiply fruits of the research cornucopia." And we might add, cross fertilization of the English language produces some pretty flowery writing.

DEFINITION

Consultant—Any ordinary guy more than 50 miles from home.

OBSOLETING THE HOUR GLASS

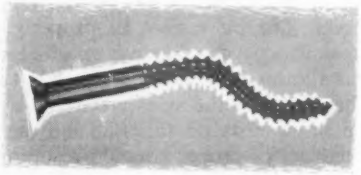
Included in a list of recently developed products is a new sun dial. It is preset at the factory for the buyer's location and is adjustable for standard and daylight savings time. We think we'll wait, however, until they iron out the bugs.

MATH OVER LIGHTLY

A schoolteacher, giving a classroom party was given money to buy prizes and favors. She found she needed one grand prize, nine individual game prizes, and party favors for each pupil. The total prizes and favors needed was 100. A local merchant agreed to supply the necessary items for one dollar. How much did the grand prize cost? At what cost were the party favors furnished? (see answer on page 67.)

KNOTHOLE WOOD SCREW

To solve a knotty problem for a customer, the engineers at Dumont Industrial Screw Corp. developed the Knothole wood screw. Designed to facilitate fastening in wood with a greater-than-usual number of knots, the screw eliminates drilling pilot holes and reduces failures and rejects.



HORSE TALK

With a horse having the improbable name of "Oink" winning most top purses in this country, and Khrushchev's boosting of horse meat for food in Russia, we are checking out the story of the poetic jockey who gave this exhortation to the horse he was riding:

"Ride hard to win, thou noble beast,
Or to Russia I'll send thee, to be feast."

BEDTIME STORY

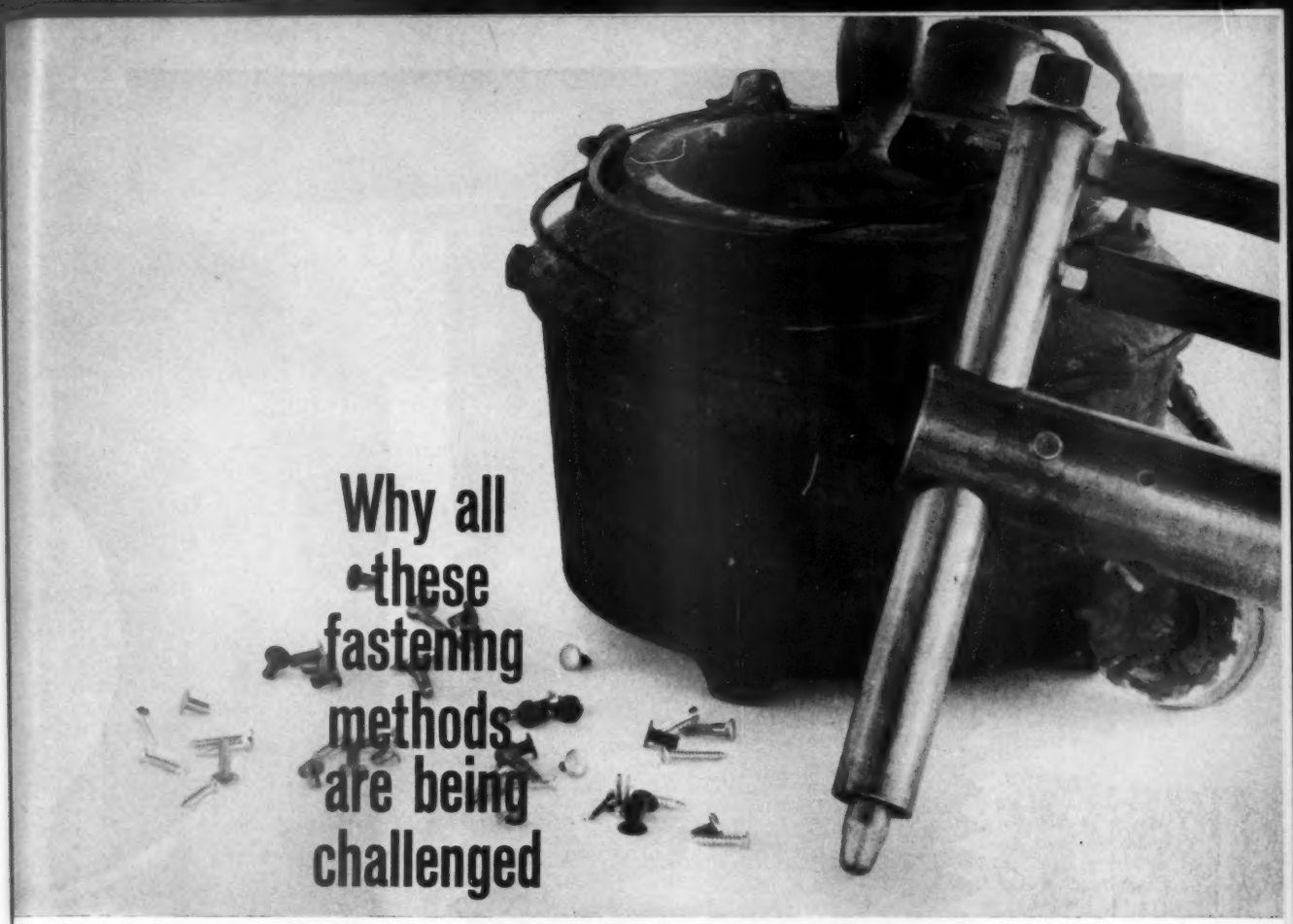
There are some things to which we will readily admit Russian superiority. Recently a Department of Agriculture study group reported that bedbugs are a major pest in Russia. And it seems to us there is a moral here, somewhere.

LIMERICK CORNER

Engineers out of school 10 years are obsolete—news item.

There once was a man, an engineer named Pete,
Whose designs were proclaimed a technical feat,
He accomplished this chore,
For 10 years, no more.
So pity poor Pete. He's now obsolete!

It is sweet to be remembered, but it's often cheaper to be forgotten—Kin Hubbard



Why all these fastening methods are being challenged by this one

Acme Steel Wire Stitching offers savings so pronounced, versatility so great, it is replacing riveting, preformed stapling, spot welding, threaded fastening and adhesion methods in even the most unusual applications. High-speed Acme Steel Wire Stitchers take wire directly from a coil—*cut* it . . . *form* it into proper size "staples" . . . then *drive* thousands of them automatically without a moment's pause for reloading. Wire stitches form their own holes, completely eliminate pre-punching, tapping, drilling, aligning rivets to holes and screwdriving. Results: many combinations of metallic or non-metallic materials can be secured with uniformly high fastening strength and speed . . . lowering fastener costs as much as one-half, speeding productive output 500% or more!

Wire stitching is no cure-all. But, an objective analysis by men who know the most about it will tell if it is feasible for you. Simply return the coupon with samples of materials you wish fastened.

ACME STEEL **IDEA LEADER IN STITCHING**

Use postpaid card. Circle No. 227

ACME STEEL COMPANY
Dept. ABW-81, 135th St. & Perry Ave., Chicago 27, Ill.
ATTENTION: WIRE STITCHING LABORATORY:

☐ Please furnish a complete analysis of wire stitching's potential in my operation—including savings potential, type equipment required and its estimated cost.

My present method is_____

Number of units per day_____

☐ Have Acme Idea Man call me for a preliminary discussion.

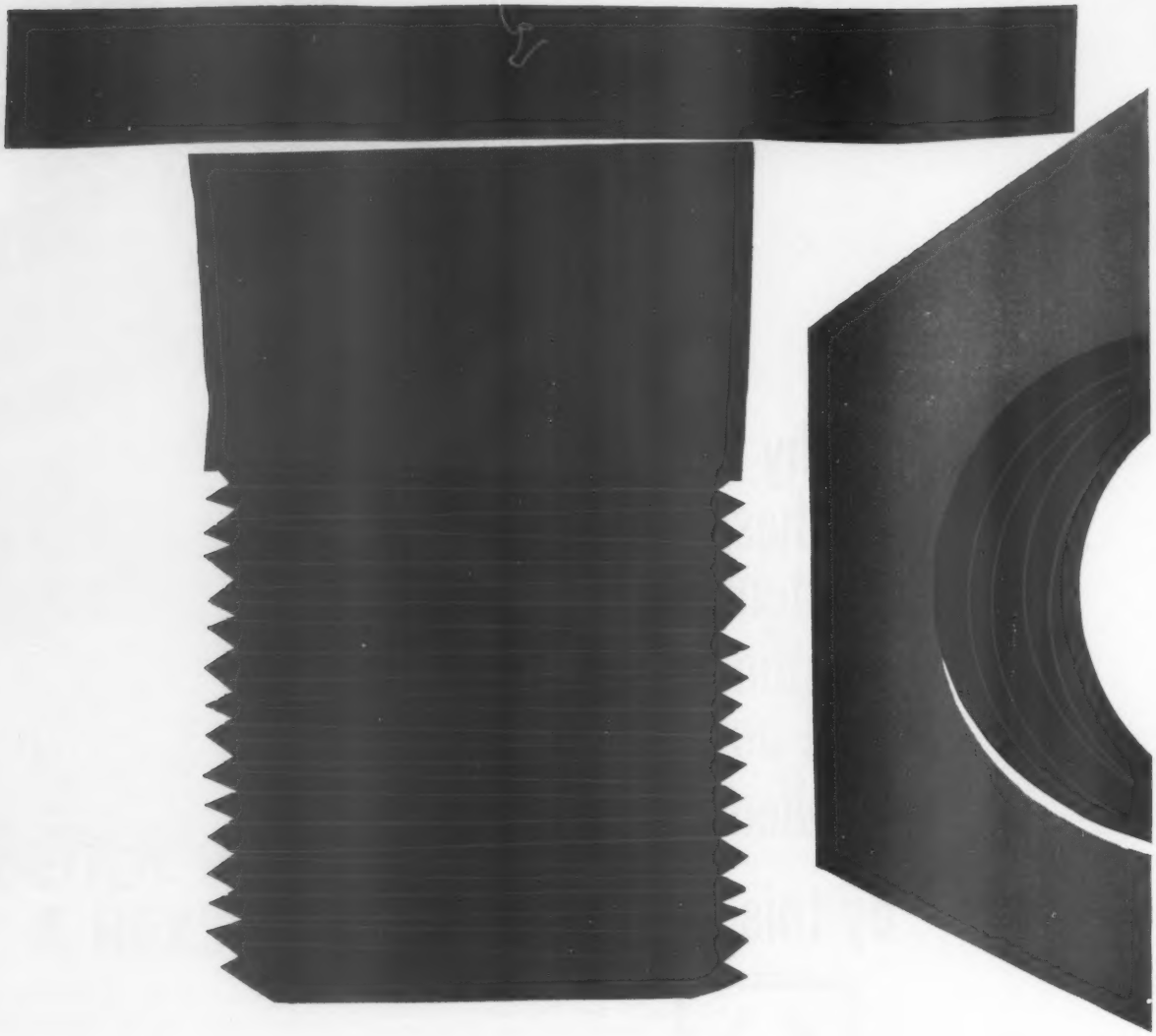
*Name*_____

*Title*_____

*Firm*_____

*Address*_____

*City*_____ *Zone*____ *State*____



imagineering the bold new look at Screw & Bolt that says "infinite design capability." Imagination, coupled with engineering, have led to endless new product design developments in fasteners and other threaded parts ■ Need a new design fastener or threaded part where standard shelf items just won't fit? Clip this ad to your letterhead and Screw & Bolt's sales engineers will put *imagineering* to work for you.

VMA 9397

SERVES THE NATION

SCREW AND BOLT CORPORATION
OF AMERICA • P.O. BOX 1708, PITTSBURGH 30, PA.
Plants: Pittsburgh, Pa. Gary, Ind. Southington, Conn. Norristown, Pa. • Warehouses: Portland, Ore. Denver, Colo. Atlanta, Ga.

Imagineering... for greater fastener progress

Use postpaid card. Circle No. 228

WHAT'S NEW IN EQUIPMENT

For information on any equipment listed here, use the postpaid card opposite page 54. Just circle the number on the card matching the number following the description. We'll do the rest.

AUTOMATIC DISPENSING GUN FOR ASSEMBLY OPERATION

An automatic-measuring flow gun is especially designed for production speed application of measured quantities of any flowable material.

The midget sized flow gun is very easy to mount and connect into any regular production operation. The metering piston is actuated by material pressures from 50 to 2500 P.S.I., determined by material viscosity.

The Model AMV-482 operates in conjunction with Pyles' standard materials-pumping equipment and pressure manifold. Normal shop air-line pressures, 60 to 70 P.S.I., are adequate.

Pyles Industries, 20855 Telegraph Rd., Detroit 41, Mich.

Use postpaid card. Circle No. 1

See No. 1

CRIMPING TOOL ALSO CUTS WIRE & STRIPS INSULATION

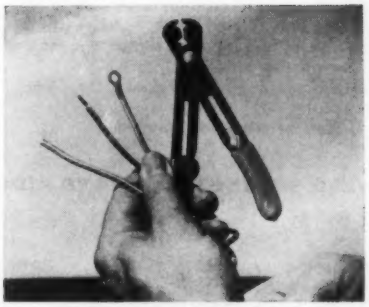
A hand tool that cuts solid or stranded wire, strips off the insulation, and crimps on solderless terminals is made from spring steel and the cutting edge on the tool is ground, not stamped.

A sliding set screw on one handle of the tool can be used when a particular setting is desired for continuous stripping of a particular size wire.

The No. 9900 tool provides enough leverage to securely crimp a 12-10 size wire. The tool is designed to work with wire sizes from No. 22 through No. 10.

R. N. Hunter Sales Co., 9851 Alburtus Ave., Sante Fe Springs, Calif.

Use postpaid card. Circle No. 2



See No. 2

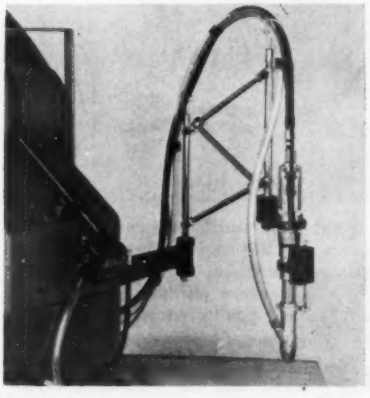
PORTABLE TOOL MOUNT FOR AUTOMATIC DRIVERS

A portable, ball-bearing supported tool mount is now available with all standard models of Tru-Tork automatic screwdriving systems. Radarm is designed to hold the tool in a vertical position at all times with no side pull. This eliminates much of the possibility of "cross threading" when driving screws into pretapped holes.

It may also be used with other tools such as drills, tappers and impact wrenches, and is ideally suited to bench operations or where assembly belts are used in a production line.

Clyde Engineering & Mfg. Co., 937 E. 10 Mile, Madison Heights, Mich.

Use postpaid card. Circle No. 3



See No. 3

CONVEYOR FEEDER FOR ASSEMBLY PARTS

The Model NF-6-168 pneumatic conveyor feeder measures 16'8" in length, has a 4" x 24" trough that can move assembly parts at capacities of up to 30 tons per hour. The feeder is operated by a Navco BH4 air vibrator that incorporates Navco's patented one-piece design.

National Air Vibrator Co., 435 Literary Rd., Cleveland 13, Ohio.

Use postpaid card. Circle No. 4

FIBERGLASS ERASER USED FOR CLEANING CIRCUITRY

A fiberglass eraser is being used for cleaning printed circuits and other electrical contacts prior to making the connection, without the necessity for using foreign agents.

The FybRglass brush eliminates undesired "resist" and "plate-through" on etched printed-circuit board. The brush also removes oxide from the portions of the printed circuit which are to be soldered for electrical connections.

The Eraser Co., Inc., 1068 S. Clinton St., Syracuse 4, N.Y.

Use postpaid card. Circle No. 5

SEMI-CIRCULAR BENCH STAND FOR ASSEMBLY LAYOUT

Semi-circular bench stand provides maximum accessibility of parts to a single assembly worker and is designed to accept the three Plastibox sizes.

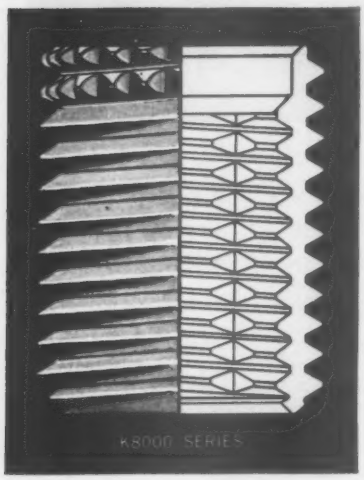
It can also be set up to mount all of any one size, or other combinations of sizes, dependent upon assembly operations.

G. B. Lewis Co., Department PCB, Watertown, Wis.

Use postpaid card. Circle No. 6

Kaylock®

Thin Wall Inserts definitely superior...



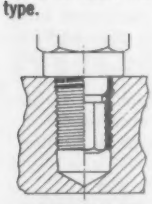
SELF-LOCKING — Famous elliptical internal thread locking device as used on all Kaylock self-locking fasteners. Only insert locking device approved to Mil-N-25027.

RETENTION — Balanced counterbore and insertion tool design gives highest positive anti-rotational retention with minimum displacement of parent material.

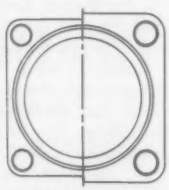
INSERTION — Wrench surface extends through entire length — prevents damage to locking feature or threads.

STRENGTH — Absolute minimum boss required in parent material yet develops full tensile strength of 160,000 PSI bolts in aluminum or magnesium castings. **Saves weight and space.** Typical rugged one-piece Kaylock heat-treated construction.

ECONOMICAL INSTALLATION — Standard shop tolerances for hole preparation — only standard drills, taps, gages used. No tangs to break off or coils to distort during installation.
17-4PH or A286 (AMS5735) corrosion resistant steels in either self-locking or non-self-locking type.



UNEXCELLED RETENTION



SAVES SPACE AND WEIGHT

All holes prepared for inserts with same internal thread size.

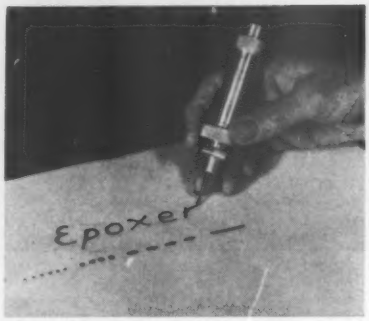
• Write today for the new Kaylock Thin Wall Insert Brochure—or contact your nearest Kaynar representative.

Kaylock® *first in lightweight locknuts*

KAYNAR MFG. CO., INC., KAYLOCK DIVISION
Box 2001, Terminal Annex, Los Angeles 54, Calif.
Branch offices, warehouses & representatives in Wichita, Kan.; New York, N. Y.; Atlanta, Ga.; Renton, Wash.; Montreal; Paris; London; The Hague

Use postpaid card. Circle No. 229

HAND DISPENSER FOR LIQUID EPOXIES



A hand dispenser for epoxy adhesives and potting compounds has finger tip control for metering the amount and the rate of flow, with positive cut-off. Once filled and pressure charged, the "Epoxer" is a completely self-contained unit.

The unit will dispense filled or unfilled materials of viscosities from water to heavy pastes. All the components are reusable or replaceable. Cartridges may be used for refrigeration storage of catalized materials until required for dispensing.

Kenics Corp., P.O. Box 27, Greenwood Station, Wakefield, Mass.

Use postpaid card. Circle No. 7

TAP SET FOR MINIATURE WORK

Tap set contains five precision taps, sizes 0-80 to 4-40, all properly heat treated and interchangeable in their companion knurled brass handle which has a solid locking chuck plus a smooth drive torque hole.

Moody Machine Products Co., Inc., 42 Dudley St., Providence 5, R.I.

Use postpaid card. Circle No. 8

LIDDED BOXES FOR STORING SMALL PARTS

Small parts handling boxes give greater inventory protection and reduce costs of handling, shipping and storing small parts.

Toteline small parts boxes with snug-fitting regular or optional transparent lids for visual inventory are available in four sizes, up to 11¾" x 8¾" x 4⅛".

Molded Fiber Glass Tray Co., Linesville, Pa.

Use postpaid card. Circle No. 9

TAPER PIN INSERTION AND REMOVAL TOOL

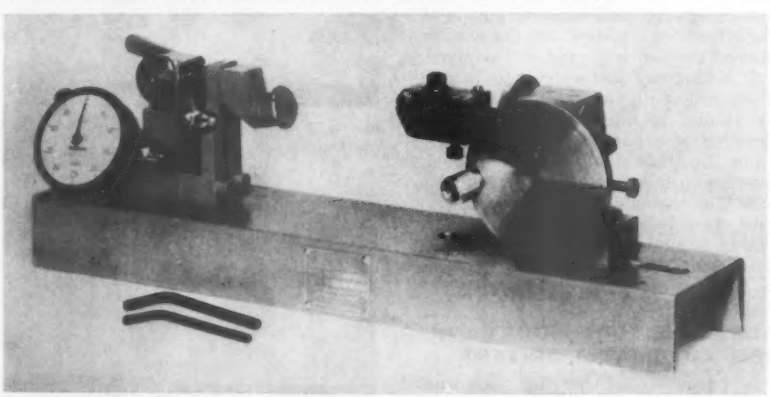
The Navcor Model 83 inspection tool is designed to facilitate the handling of standard series 53 taper pins during both initial assembly and rework.

The tool features a grip-lock head which holds the pin firmly during insertion or removal; a snap action drive mechanism, which provides the proper force necessary for pin insertion; and a streamlined head which permits a pin to be grasped when clustered in a tight configuration on the connector.

Navigation Computer Corp., 1621 Snyder Ave., Philadelphia, Pa.

Use postpaid card. Circle No. 10

WELD STRENGTH TESTERS AIDS QUALITY CONTROL



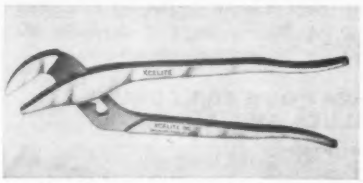
Weld joint tensile testers find application in the development of weld schedules used in high density electronic component packaging as well as in statistical quality control of production welding.

The VTA-46, has a testing range of 0-50 pounds, and the VTA-47 a 0-100 pound range. Both models feature a load indicator which holds the maximum specimen pull until reset. A one to one mechanical adjustment of the load jaws makes possible quick set-ups, but actual loading is applied through a 100-1 reduction wheel.

Hughes Aircraft Co., Vacuum Products Div., 2020 Short St., Oceanside, California.

Use postpaid card. Circle No. 11

UTILITY PLIERS ARE THINNER & STRONGER



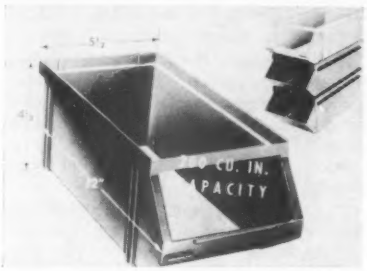
A forged alloy steel utility plier in 7" and 10" lengths is being marketed by Xcelite, Inc., Orchard Park, N.Y. Features double-strong box joint construction and flush-ground rivet pin. The plier is 30% thinner than conventional models.

For use on flat, square, hex, or round-shaped objects, it is designed to produce powerful leverage in each of 4 gripping positions with no sideway twist or strain. Simple lever-action movement of the handle quickly adjusts serrated jaws to the desired opening.

Xcelite, Inc., Orchard Park, N.Y.

Use postpaid card. Circle No. 12

CARD HOLDERS ON PLASTIC BOXES AID IDENTIFICATION



Coupled with an exclusive front stacking rim, which assures positive stacking, plastic storage boxes have a molded card holder for marking contents and making identification easier.

Plastic Stackbins can be interstacked with companion steel units. They are lightweight, non-corrosive, non-magnetic and waterproof.

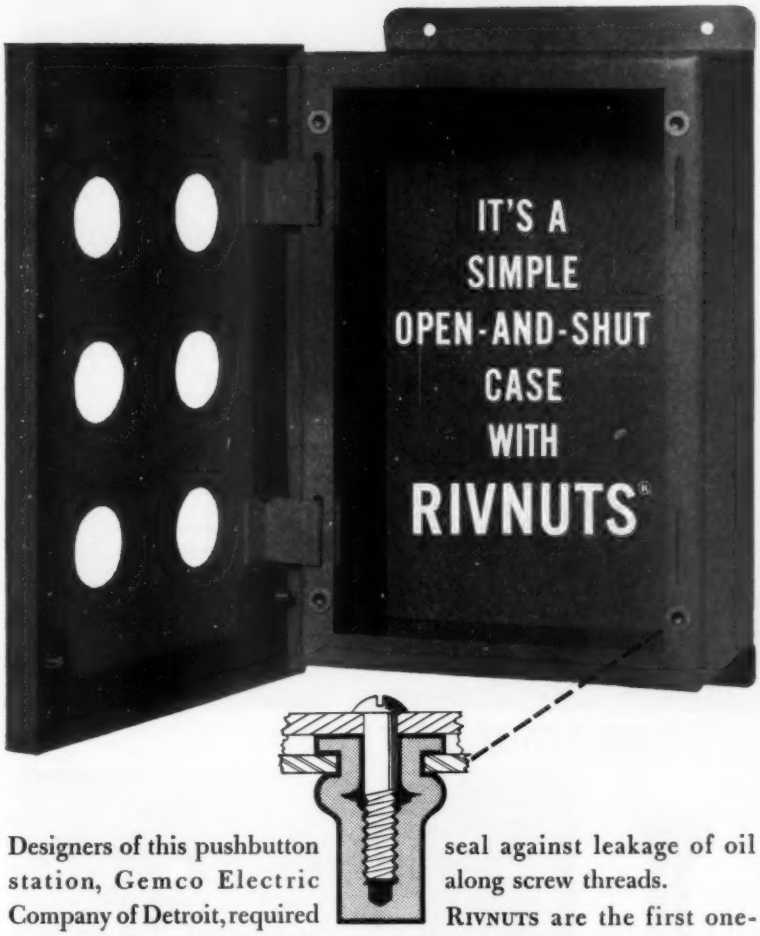
Stackbin Corporation, 1155 Main St., Pawtucket, R.I.

Use postpaid card. Circle No. 13

MEMORY POINTER ON TORQUE WRENCH AIDS INSPECTION

A measuring instrument for making mechanical checks of stress, strain, thrust, tension and compression, where a record of peak reading is desired, is equipped with a memory pointer.

The device is claimed to be more accurate than standard reading or audible indicators used in testing.



Designers of this pushbutton station, Gemco Electric Company of Detroit, required an oil-tight enclosure with a cover that could be attached or removed as simply as possible. The usual solution would be clamps and brackets. Instead, RIVNUTS were installed in the frame so that the cover could be fastened to them with ordinary screws. With RIVNUTS as sturdy nutplates, time and cost of assembly is greatly reduced. There's no need for drilling and tapping blind holes. And RIVNUTS with closed ends effectively seal against leakage of oil along screw threads.

RIVNUTS are the first one-piece blind rivets with internal threads. They help solve many fastening problems faster—better, and at reduced cost. New data book describes principle, typical applications, lists sizes and tool data. For a free copy write Department AE-8, *B.F.Goodrich Aviation Products, a division of The B.F.Goodrich Company, Akron, Ohio.*

B.F.Goodrich

RIVNUTS

Use postpaid card. Circle No. 220

FOR CONTROLLED QUALITY.

FROM START TO FINISH

CHECK WITH **chandler**
FOR PRECISION FASTENERS

Precise chemical, metallurgical and dimensional controls embodied in every Chandler fastener are your assurance of high quality fasteners to meet critical performance requirements. Chandler employs advanced production techniques . . . tests for tensile, yield, creep and stress rupture to meet military and industrial standards . . . produces the finest cold-headed cap screws and bolts from high carbon, alloy, super alloy and stainless steels *economically, efficiently and on-schedule!*

Check with Chandler today or write for Chandler catalog.

chandler
products corporation
1543 Chardon Road • Cleveland 17, Ohio

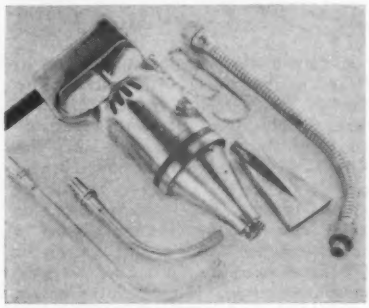
Use postpaid card. Circle No. 231

The memory indicator is pushed along a track on the face of the scale as torque is exerted, and remains at the peak torque.

P. A. Sturtevant Co., Addison, Ill.

Use postpaid card. Circle No. 14

HEAT GUN FOR CURING GLUES AND ADHESIVES



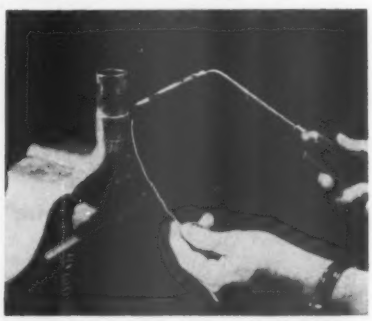
A compact portable heat blowing unit has features that make it suitable for assembly line operations. The model HG heat gun is being used for assembly line curing of thermo-setting glues and adhesives. It has also been found useful for expanding bearings or sleeves during shrink fit assembling. Another use has been in the softening, welding or fusing of plastic products.

A temperature of 450° F can be generated instantaneously without the danger of an open flame. This heat can be delivered at a rate of 15 CFPM through a 5/8" diameter orifice by a specially designed built in pusher type blower.

The United States Electrical Tool Co., Dept. HG, 3640 Llewellyn St., Cincinnati 23, Ohio.

Use postpaid card. Circle No. 15

BRAZING TORCH FEATURES AUTOMATIC IGNITION



A air acetylene torch, has flame which triggers on or off automatically without external ignition.

When the safety trigger is pressed, a battery operated electronic device lights the torch instantly. Releasing the trigger shuts the gas off and the flame goes out. This feature reduces gas consumption by as much as 80% on stop and go jobs.

Burning acetylene, the Prest-O-Matic torch produces more heat, according to field reports, than conventional air-gas torches. It is ideal for silver brazing,

soldering, and for tempering of light gauge metals.

Navan Products, Inc., 900 N. Sepulveda, El Segundo, Calif.

Use postpaid card. Circle No. 16

TOOL STEEL LOCKING PLIERS EASILY ADJUSTED

Lever action locking pliers are designed for fast adjustment and simple thumb trigger release. Only one hand need be used for both adjusting to proper pressure and unlocking. All parts are precision manufactured of alloy tool steel to insure durability.

The Gripso pliers are furnished with hardened steel serrated jaws which are easily replaced with soft blank jaws that can be machined to suit special applications for either holding, crimping, or bending. Normal hand pressure converts to 2000 lb. pressure at jaws.

Standard Fittings Co., 82 Herbert St., Framingham, Mass.

Use postpaid card. Circle No. 17

WRENCH OVERCOMES FRICTIONAL RESISTANCE

Frictional resistance in bolt tightening is overcome with a tension control wrench, assuring solid construction. A built-in standard control permits adjustment of the wrench to obtain tension from 25 to 100% of the elastic limit of the bolt.

The 18B-7T has a rated capacity of ¾" and 18B-9T a rated capacity of 1¼". Because of the tension control, capacities will vary according to material and tension required.

Gardner-Denver Co., Quincy, Ill.

Use postpaid card. Circle No. 18

AIR PRESS FOR PRECISION PARTS AND ASSEMBLIES

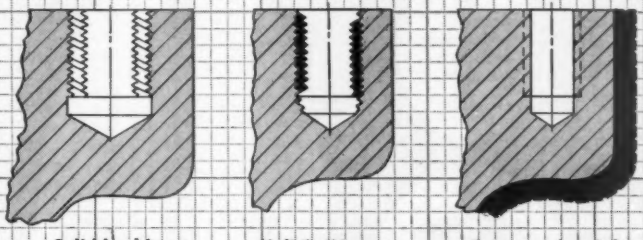
A pneumatic press is used for accurate assembly and working of small metal parts.

The speeds of the up and down strokes of the PH-3 are independently controlled, delivering with chronometer accuracy a powerful action which squeezes the work without any impact. This eliminates distortion and breakage, and the work pieces are produced with a precision that will meet the most rigid requirements.

Howard International, Inc., 350 Fifth Ave., New York 1, N.Y.

Use postpaid card. Circle No. 19

How You Can Save Boss Space and Weight in Thread Design ...with HELI-COIL® Inserts



Solid bushing requires oversize boss

Heli-Coil Insert permits standard boss proportion

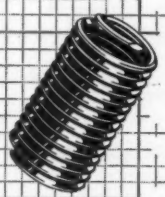
Space and weight saved by *Heli-Coil* Insert

As seen in the illustrations above, *Heli-Coil* Inserts save 56% in space, 63.5% in weight.

Heli-Coil stainless steel wire inserts have a smaller outside diameter than any solid bushing. Therefore, with ***Heli-Coil*** Inserts you can design boss radii to a minimum, yet stay with standard boss configurations. This means *savings in space and weight*, and material-savings as well.

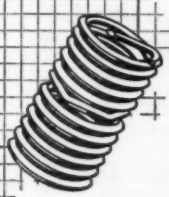
This feature is vitally important for miniaturization in aerospace design, in electrical and electronics equipment design, and for general industrial applications.

NO OTHER TYPE OF INSERT OFFERS SUCH SAVINGS!



Heli-Coil Standard Insert
for stronger, smoother, lifetime threads

Permanently protects threads against wear, stripping, corrosion, galling, seizing, vibration, and shock. Made of 18-8 stainless steel wire, this precision-formed ***Heli-Coil*** Insert has a tensile strength of approximately 200,000 psi. Conforms to military standards and all commercial and industrial thread forms.



Heli-Coil Screw-Lock Insert
eliminates lock wiring and lock nuts

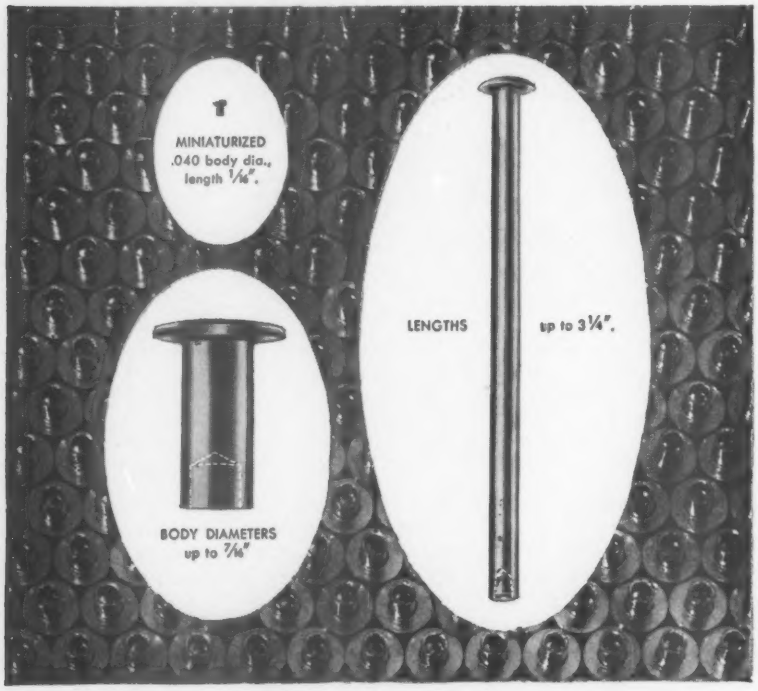
This one-piece wire Screw-Lock Insert provides all the thread protection of the Standard Insert, PLUS an exclusive resilient *internal* locking feature that eliminates clumsy protruding lock nuts, lock wiring and other supplementary locking devices. *It saves cost, space and weight* – permits simple streamlined design in standard bosses. Meets military and N.A.S. specifications for locking torque and vibration.

The Heli-Coil line of products includes: inserts and related taps, hand tools, power inserting tools, automated tooling, and gages. Tables of boss radius and weight comparison are available. Write for complete details and design data. 2508A

HELI-COIL CORPORATION
3108 Shelter Rock Lane, Danbury, Connecticut
In Canada: ARMSTRONG BEVERLEY ENGINEERING LTD.
6975 Jeanne Mance St., Montreal 15, Que.

Use postpaid card. Circle No. 232

Look at this Size Range of Semi-Tubular Rivets... it's the way to lower cost



Miniaturized components and also large complete assemblies can now have all the money-saving advantages of using single and multiple automatic riveting. This is due to the wider size range of semi-tubular rivets now available and which can be used in conjunction with motor and pneumatic driven automatic riveting machines.

Today, there is hardly a fastening problem, involving even fragile materials, that does not warrant consideration of low-cost semi-tubular rivet setting.

Our Factory Riveting Specialists are ready to help you obtain the REAL COST FACTS on your own specific fastening problem. There is no obligation.

FOR YOUR FILES

Chicago Rivet Catalog describes 1388 standard tubular and split rivets and 25 single and multiple automatic rivet setters.

AIR-POWERED RIVETING

contains description and specifications of 8 single, multiple riveters— also rivet setters designed for automated operation.

Chicago Rivet & MACHINE CO.

946 So. 25th Ave., Bellwood, Ill. (Chicago Suburb)
Branch Factory: Tyrone, Pa.

Use postpaid card. Circle No. 234

IMPROVED TORQUE CONTROL FOR PNEUMATIC DRIVERS

The 21F and 22F series fastening tools have 24 different models for air-powered nutrunning and screwdriving, including several models equipped with a torque control "one shot" clutch.

This tool provides just a single pulse of torque for better quality control of the fastening operation, longer life for the bit or socket, and less damage caused by the bit slipping off the fastener and marring the work piece.

The two series offer an extensive product line and capacities up to No. 10 machine screw. Weights range from about 1¾ to 2¼ lbs. and lengths from 8-5/16" to 10-13/16", with an 11/16" offset on all models.

Buckeye Tools Corp., 5003 Springboro Pike, Dayton 1, Ohio.

Use postpaid card. Circle No. 20

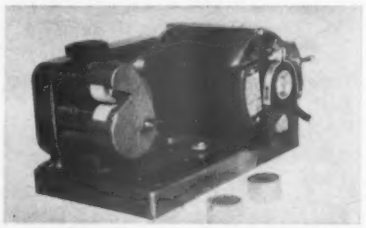
SCREWDRIVER KIT FOR HARD TO REACH PLACES

A screwdriver kit for hard to reach hex and multiple-spline set screws contains four screwdrivers with an over-all length of 10½" in size numbers 2 to 8, and a packet of accessory parts, all packaged in a heavy canvas container.

The Bristol Co., Socket Screw Div., Waterbury 20, Conn.

Use postpaid card. Circle No. 21

HIGH SPEED WIRE STRIPPER USES LITTLE BENCH SPACE



The WR-6 wire stripper has been specifically designed for resistance and magnet work and similar applications.

Employing a minimum number of moving parts, it is a tool requiring little bench space. It is 8" wide x 10" deep x 6" high with a net weight of only 15 lbs.

Two abrasive wheels instantly remove the wire coating with no damage

assembly and fastener engineering

AUGUST, 1961

(Not valid after October 31, 1961)

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to the conductor. Various density wheels are available to meet each and every requirement.

High Speed Hammer, 313 Norton St., Rochester 21, N.Y.

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CHILLER RETARDS AGE HARDENING OF RIVETS

Age hardening of aluminum rivets and blanks can be retarded, and annealing temperatures reduced through the use of a chilling unit.

The Model B-10, designed to operate at a holding temperature of —40° F, is caster mounted. The current may be off for as long as 1½ hours before there is a noticeable rise in temperature. Five removable racks hold 50 cannisters 2" dia. and 10" long.

Cincinnati Sub-Zero Products, 3930 Reading Rd., Cincinnati 29, Ohio.

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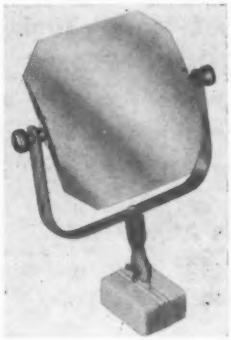
MAGNETIC BASED LENS FOR SMALL PARTS ASSEMBLY



A magnetic-based lens used for close inspection and small parts assembly provides a large 6" x 6" magnifying area for non-fatiguing binocular use.

The shatter-proof cast acrylic plastic lens will withstand production line abuse while eliminating the danger of cuts and gashes characteristic of glass lenses.

The 3-power lens is particularly adapted to electronics assembly operations and tool room work. "Magnalens" is positioned thru the use of a small, permanent magnet base which has a holding force of more than 60 lbs.

Recarr, Inc., 126 North Clinton St., Chicago 6, Ill.

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If we don't stock the plier-type tool you need

we'll make it for you

Using an exclusive cost-saving system of matched components, Sargent will design and build the plier-type tool you need for production, product installation, or maintenance. Sargent "Specials" cut, crimp, hold, shape, or perform a dozen other operations.

And Sargent is an experienced hand at making both "special" and standard hand tools. Variations of our compound action or standard action pliers are used by major companies all over the country. Available completed or with blank jaws and frames, you'll find the Sargent system is the answer to the purchase of quality special purpose hand tools in both large or small quantities at economical prices.

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TORQMATIC

By ARO

Versatile Screwdrivers and Nutsetters with

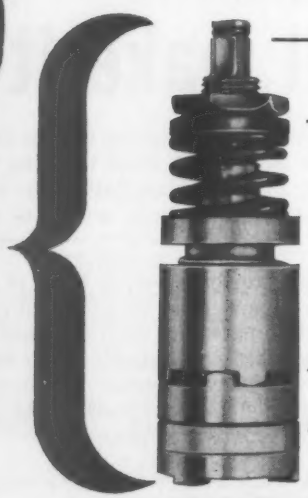
Single Action Clutch

This new Torqmatic is no ordinary clutch. It delivers uniform torque action through any number of cycles. Torque is preset and operator cannot overrun the threaded fastener. What's more, action is *positive*. Clutch disengages instantly when torque limit is reached . . . and remains disengaged until pressure on the work is released. There is no noisy ratcheting. And there is no impacting action. This means you can use Aro Torqmatic on highly delicate work.

As for reliability, consider this: Aro Torqmatic features new, simplified design with fewer working parts. You can't beat it for high-production performance on your toughest screwdriving and nutsetting jobs.

Job test Aro Torqmatic, and experience for yourself its superior performance capabilities. Just ask your Aro Distributor.

Fully Interchangeable With The Clutch In Any ARO "0" Series Or "000" Series C-Model Tools . . .
NO ADAPTORS OR SPECIAL TOOLS NEEDED!



- Easy to Adjust — Maintains Settings Indefinitely
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- Smooth Ball Bearing Action
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Ultrasonic Controls

Use postpaid card. Circle No. 237

WHAT'S NEW IN FASTENING AND JOINING

For further information on any of the fasteners or methods use the handy postpaid card opposite page 54.

BALL LOCK PINS IN GREATER SIZE RANGE

Ball-Lok detent pins are now available in diameter size ranges from ¼" to 1", with grip lengths in 1/10" increments.

In these solid shear pins the balls are spring loaded, and the opposite placement of the balls equalizes pull forces, which prevents jamming. Detent pins are available in 4130 alloy steel and 303 stainless steel.

Avdel, Inc., 210 S. Victory Blvd., Burbank, Calif.

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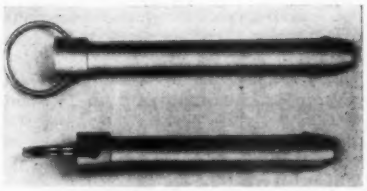

See No. 30

CLIP NUT FEATURES HEAVY DUTY SPRING

A new clip nut series, the SL100, features a powerful spring clip that virtually defies excessive loading and abusive treatment. Full structural integrity is further assured by the wrap-around retainer design, thru which spring and retainer work together to resist torque-out and push-out.

Sizes now offered include 8-32 and 10-32, for mounting on panels up to .090 thick and with edge margin to ½". Thread-locking to MIL-N-25027 is standard.

Shur-Lok Corp., 879 S. East St., Anaheim, Calif.

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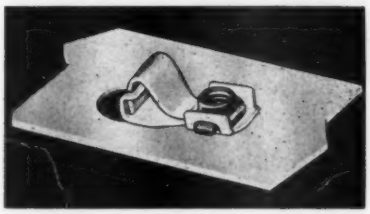


See No. 31

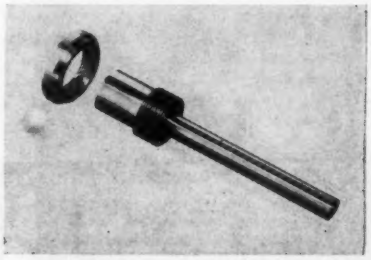
RETAINER NUT ELIMINATES TAB WASHERS, KEYWAYS

A Nylok bearing retainer nut eliminates the use of tab washers and milled keyways. Ideal for any shaft application where a nut holds a bearing, it is already in use in pump, transmission and helicopter bearing assemblies.

Bearing lock nuts are available in any standard or special alloy, and in all thread sizes.

Nylok Corporation, 611 Industrial Ave., Paramus, N.J.

Use postpaid card. Circle No. 32



See No. 32

HIGH STRENGTH ADHESIVE CURED AT LOW PRESSURES

A high strength thermosetting film adhesive can be cured at low pressures for metal-to-metal bonding and metal honeycomb sandwich construction.

Scotchweld brand AF-110, can be cured under pressures in the range of 10 to 25 psi. The only pressure necessary is that required to provide contact between the parts being bonded and to keep the parts properly aligned. This advantage eliminates the need for elaborate or expensive jigs and fixtures for pressure application and makes the adhesive applicable to production bonding operations.

The adhesive exceeds the requirements of military specification MIL-A-5090D-Type 1 for metal-to-metal bonding and MIL-A-25463-Type 1, Class 2 for honeycomb sandwich construction.

Minnesota Mining and Manufacturing Co., 900 Bush Ave., St. Paul 6, Minn.

Use postpaid card. Circle No. 33

DRY FILM LUBRICANT FOR EXTREME TEMPERATURES

An inorganic-bonded, dry film lubricant with a useful temperature range of from — 300° to +1200°F is now being produced under a licensing agreement with its inventors. The extreme-environment lubricant was developed by scientists after years of experimentation and testing.

In addition to its wide temperature range, Molykote X-15 is insensitive to liquid oxygen; has proved to be unaffected by up to 5×10^6 roentgen gamma radiation; retains its lubricating properties under vacuums up to 10^{-9}mm of Hg; and is easy to apply in either shop or field.

Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn.

Use postpaid card. Circle No. 34

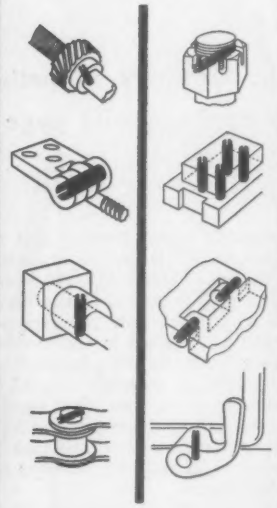
SCREW-THREAD INSERTS FOR MINIATURIZATION USE

Screw-thread inserts for providing permanent threads in soft metals are now available in new miniature sizes. Produced in five new sizes, the wire inserts are designed to meet the stringent size requirements in the miniaturization of aero-space instru-

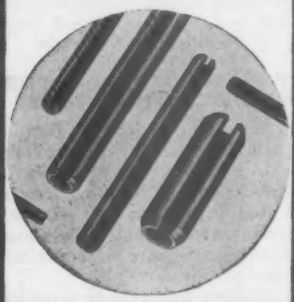
GILLEN

EVERY TYPE OF KEYING AND PINNING DEVICE FOR PRODUCTION ASSEMBLING

Self-Fitting
TENSION PINS
Speed
Many Assemblies
and Stay Put!



Tension holds them Tight!
in Metal/Plastics/Ceramics



GILLEN TENSION PINS
are hollow, hardened, chamfered-end spring steel fasteners designed to hold many materials efficiently and reduce production-assembly costs.
Diameters: 3/64ths to 1 inch.
Lengths: from 3/16ths inch.
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PIVOTS • BUSHES • TENSION, TAPER, GROOVE & DOWEL PINS • MACHINE KEYS & PARTS

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ments, electrical and electronic equipment, and other general industrial instruments.

Heli-Coil Corp., Danbury, Conn.
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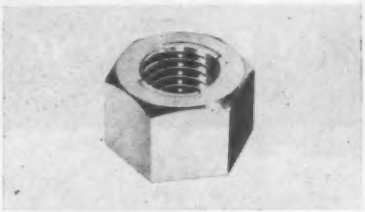
LOCK NUT WITHSTANDS SEVERE VIBRATION



The Uni-Torque lock nut assures a positive locking action in applications where there is severe vibration or heavy shock loading.

The use of the lock nut eliminates the need for auxiliary locking devices such as cotter pins, washers, and double nuts. It is a one-piece, all-metal, reusable torque type of lock nut in which the lock is developed by deflecting the top threads slightly out of their true helix.

Nut will lock in any position on bolt provided a minimum of 1 to 1½ bolt threads protrude beyond the top of the nut.

MacLean-Fogg Lock Nut Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Use postpaid card. Circle No. 36

NYLON STRAPPING IN GREATER SIZE RANGE

New sizes have been added to line of perforated nylon strapping. The complete line now includes strapping widths from .160" to ⅝", thicknesses from .030" to .070", in various hole sizes and spacings or non-perforated. The strapping is available in either black or natural nylon from stock, in 25- or 50-ft. roll dispensing packages.

The strapping is made of non-conducting nylon suitable for service between —60° F and 275° F. Highly solvent-resistant, the units are unaffected by petroleum oils and greases at temperatures up to 300° F.

Weckesser Co., Inc., Dept. AE-3, 5701 Northwest Hwy., Chicago 46, Ill.
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Immediate Delivery—AN—N.A.S.—M.S.—9 Digit
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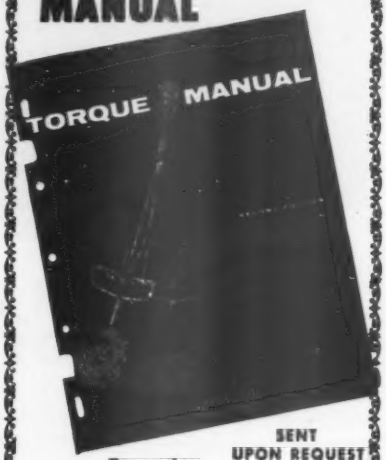
9310 West Jefferson Blvd., Culver City, Calif.
Telephone—UPton 0-5923—Teletype—CVR CY 4136
TOUGH SPECIALS 10 DAY DELIVERY

"TORQUE WRENCH" MANUAL



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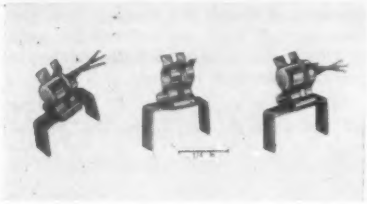
TRANSISTOR MOUNTING CLIP FOR PRINTED CIRCUITS



A transistor clip for TO-23 case size has two annealed tabs for insertion in a printed circuit board. These tabs bend to lock in place.

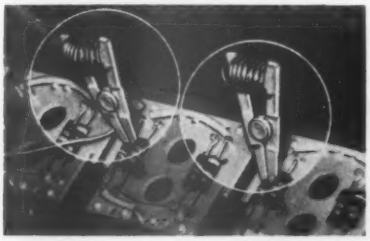
The clip is slotted to eliminate any damage to the transistor during insertion. The slot provides a cooling contact area for the center flange type case similar to the 2N207 and 2N533B in addition to preventing any lateral motion under shock and vibration.

The clip, No. 100-320, is produced with tab lengths from 1/32" to ¼" long for use with different board thicknesses and with other platings for ease in soldering such as hot-tin dip, silver or electro-tin.

Atlee Corporation, 47 Prospect St., Woburn, Mass.

Use postpaid card. Circle No. 39

HEAT SINK CLIP PROTECTS SEMI-CONDUCTORS



A new heat sink clip, designed to protect semi-conductors during the soldering phase of electronic assembly, is made of aluminum. It fits around the wire running between the semi-conductor and the joint to be soldered. During the soldering operation, it absorbs and dissipates the heat that runs up the wire toward the semi-conductor.

Avtron heat sink clips are easy to use on assembly operations and can effect important savings in reducing assembly time and rejects.

Avtron Manufacturing, Inc., 10409 Meech Ave., Cleveland 5, Ohio.

Use postpaid card. Circle No. 40

FAST CURING EPOXY ADHESIVE FOR ASSEMBLY USE

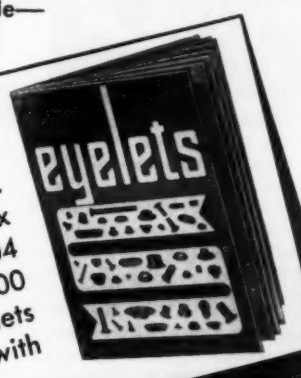
Formulated especially for assembly line production, Leebond 40 is said to be suited for bonding a wide variety of materials within one to three minutes under an infra-red lamp or in a 100°-125°C. oven. Based on a new curing agent, the adhesive is of the two-component solventless type, yet has a room temperature pot-life of 2 to 6 hours depending on volume.

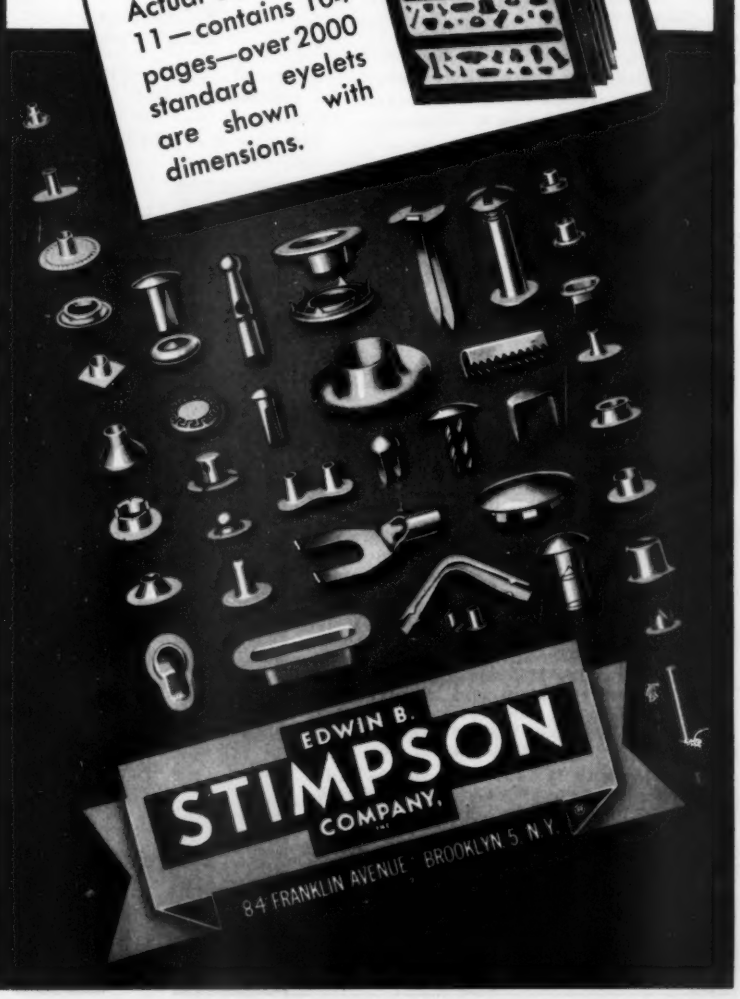
Especially suited for bonding paper,

Are You Familiar With The Different Articles We Make?

You will find us prepared to supply a type of fastener that is exactly suited to your specific requirements. If you use split rivets, tubular rivets, side-prong rivets, eyelets, washers, grommets, snap fasteners, or any other similar metal article—write for samples and prices—today.

Send for your copy of this valuable free book. Actual size 8½ x 11—contains 104 pages—over 2000 standard eyelets are shown with dimensions.





EDWIN B. STIMPSON COMPANY, INC.
84 FRANKLIN AVENUE · BROOKLYN 5, N.Y.

Use postpaid card. Circle No. 240

cloth, glass, ceramic, plastics, and other low-heat conductive materials, the adhesive is now being used in several assembly line applications including the production of loud speakers.

Leepoxy Plastics Co., Dawkins Rd., New Haven, Ind.

Use postpaid card. Circle No. 42

FLAT HEAD CAP SCREWS ADDED TO COMPANY LINE

A line of fasteners for industry is expanded with introduction of flat head cap screws in diameters of ¼" through ¾" in all cataloged lengths. All surfaces of the head, point and the slots are machined.

Mechanical properties of these screws are enhanced by cold heading and rolled threading, imparting increased resistance to fatigue failure. Greater design flexibility, especially when fastening thin sections to an assembly, is allowed by threading up to the screw head.

Screw and Bolt Corp. of America, P.O. Box 1708, Pittsburgh 30, Pa.

Use postpaid card. Circle No. 43

WELDED INSERTS FOR ROUND & RECTANGULAR TUBE

Tubing inserts for round tubing from 1" to 1¼", with internal or external threads and rectangular tubing from ⅞" to 1½" are made in a two-piece welded part.

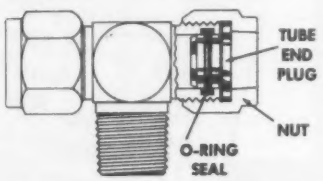
The parts were developed for manufacturers of steel office furniture, partitions, and similar products in which tubular sections are integral parts.

Ohio Nut & Bolt Co., 50 First Ave., Beren, Ohio.

Use postpaid card. Circle No. 44

O-RING SEAL USED IN PLUG AND CAP FITTINGS

LENZ "O-RING SEAL" PLUG FOR TUBE END OF FITTINGS



A special plug for fittings and one for capping tube ends have been developed using an o-ring seal.

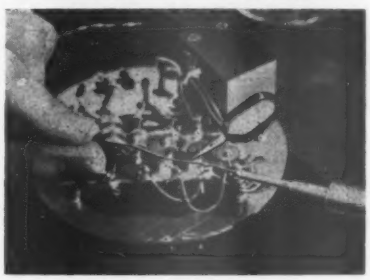
The plug is designed to close off the tube-end of the fitting. It goes inside the fitting in place of the tube with the o-ring doing the sealing and the shoulder of the nut serving to hold and grip the plug separately from the seal. No sleeve is needed.

The cap is designed to fit and close off the end of the tube. The o-ring seals the tube separately from the split-ring grip. No threading, flaring, or soldering is required.

The Lenz Co., 3301 Klepinger Rd., Dayton 1, Ohio.

Use postpaid card. Circle No. 45

MIDGET HEAT SINK REACHES INTO HARD TO GET AREAS



A small, lightweight heat sink is 1½" long and has slimmer points to get into confined areas. The 51G sinks are made of Berlyco 10 which has a high thermo-conductivity and good spring characteristics.

The handles are covered with plastic

SYNFLEX
Self-Storing Air Hose

STORES IN 1/30TH IT'S WORKING LENGTH

With a working length of up to 23 feet, Synflex Self-Storing Air Hose retracts automatically into a storage coil only 9 inches long — neat and compact for space saving and SAFETY.

Made from a special Nylon formulation, Synflex is lighter and less bulky than rubber hose. Ideal for air-driven equipment — portable or fixed installations. It is kink and abrasion-resistant and impervious to oils and greases. Micro-finished bore and full-flow, reusable fittings assure unobstructed air flow to 200 psi.

Available with ¼" I.D. (S8) and ⅜" I.D. (S12). Brown-orange color gives high visibility — for safety. Full details on request.

A-37SHA

SOME DISTRIBUTOR TERRITORIES OPEN

SYNFLEX
Products Division
Samuel Moore & Co.
Mantua, Ohio

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SEND FOR YOUR FREE COPY!

TA's new Manual 210G gives you 94 pages of prints, tables, illustrations, specs and installation tips.

Save money for your company. Conserve your valuable time. Don't design clamps when TA offers you 40,000 of them to choose from at off-the-shelf prices!

This free manual shows all sizes and styles of loop clamps, bonding clamps, multiple clamps, center clamps, wire harness clamps, wave-guide clamps—plus blocks, brackets, busbars, line supports, and related items.

Sizes from ⅛" to 6" diameter in 16ths for bolt mountings from #4 to ⅜". Available in aluminum, steel, and stainless. All manner of high and low temperature insulation materials.

Put this free manual to work for you! Write TA today.

TA Mfg. Corp. 4607 Alger Street
Los Angeles 39, Calif. (or call CH 5-3748)
TWX 9863 Glendale, Calif. • WUX CAT Los Angeles, Calif.

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to keep the finger area cool and comfortable.

R. N. Hunter Sales Co., 9851 Alburtus Ave., Sante Fe Springs, Calif.

Use postpaid card. Circle No. 46

LOCKING CABLE STRAP CUTS ASSEMBLY COSTS

Securing wire or cable to sheet metal surfaces in original equipment may be speeded with plastic cable straps. Inserted in a blind mounting hole, the strap is securely locked by thumb pressure, without tools. Metalized gray plastic construction provides excellent strength and vibration characteristics. The installed strap hermetically seals the mounting hole.

Straps to fit various sized mounting holes and wire or cable diameters are available.

Budwig Manufacturing Co., P.O. Box 4212, Glendale 2, Calif.

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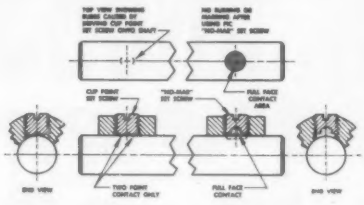
NYLON-INSERT SET SCREWS PREVENT SHAFT BURRING



Set screw is designed specifically for securing precision instrument gears, couplings, pulleys, cams, hand cranks, knobs, etc. to small-diameter shafts without raising burrs on the shafts.

Stainless steel No-Mar set screws are manufactured with slotted or socket heads in sizes 2-56, to ¼-20.

PIC Design Corp., Subsidiary of Benrus Watch Co., Inc., 477 Atlantic Ave., East Rockaway, L.I., N.Y.

Use postpaid card. Circle No. 48

ONE PIECE SPACER NUT SPEEDS ASSEMBLY

A self-locking spacer nut, has been developed to eliminate certain spacer problems.

Some features of the nut are: it cannot shake loose under even the most severe vibration; reduces assembly and disassembly time about one-third because there is only one piece to handle, no galling of surfaces, no seizing of

Here's what Quality-Controlled

PALNUT® LOCK NUTS

can do for your assemblies!

PALNUT Lock Nuts are single-thread lock nuts made of spring-tempered steel, with coned, notched thread-engaging center formed to fit screw threads accurately. Perfect hex shape, straight sides, ample height for easy, speedy wrenching. Regular type, shown above, illustrates locking action of all PALNUTS.

DOUBLE LOCKING ACTION

When PALNUT Lock Nuts are tightened, powerful spring forces (A-A) are exerted upward on the screw threads and downward on the part. Spring forces (B-B) are exerted inward, to grip the threads like a chuck.

- **REDUCE COSTS.** PALNUT Lock Nuts are precision-produced in huge volume at very low cost—priced less than other locking methods, often less than plain nuts.
- **REDUCE PARTS.** A single PALNUT can replace an ordinary nut, lock-washer, flat washer and sealer washer according to type used.
- **SPEED UP ASSEMBLY.** PALNUTS apply easily and fast with ordinary manual or power tools—extra fast with PALNUT Magnetic Wrenches. No auxiliary fastener parts to handle.
- **HOLD SECURELY.** PALNUTS exert a resilient, double-locking action that holds tight under severest vibration.
- **SAVE SPACE.** Most PALNUTS require less space than other fasteners and save additional space by eliminating lock-washers and flat washers.
- **SAVE WEIGHT.** PALNUTS save 65% of the weight of ordinary nuts, 80% of nut and lockwasher, 85% of nut, lock-washer and flat washer.

WRITE for detailed catalog giving engineering data, dimensions, load ratings, installations of all types of PALNUT Lock Nuts. Describe application for free samples. Call in a PALNUT fastening engineer for discussion.

THE PALNUT COMPANY

DIVISION OF UNITED-CARR FASTENER CORPORATION

79 Glen Road, Mountainside, N. J.

Canada: P. L. Robertson Mfg. Co., Ltd., Milton, Ont.

PALNUT® LOCK NUTS

for quick, secure fastening at low cost

Use postpaid card. Circle No. 243

nuts; high resistance to shock, heat and corrosion; may be re-used many times without deterioration.

Western Sky Industries, 1907 West Winton, Hayward, Calif.

Use postpaid card. Circle No. 49

POLYETHYLENE TUBING FOR FLEXIBLE CONNECTIONS

A new line of tubing is made of the highest molecular weight, low melt index polyethylene resin.

Synflex P-1 is ideal for air lines, either permanent or temporary hook-ups, where low-cost flexible connections are required. The tubing is unaffected by most chemicals including concentrated hydrochloric, sulphuric, and hydrofluoric acids. It is strong and tough and its stress-cracking resistance is the highest of any polyethylene.

Synflex Products Division, Samuel Moore & Co., Mantua, Ohio.

Use postpaid card. Circle No. 50

O-RINGS HAVE HIGH DIMENSIONAL STABILITY

A line of special o-rings is said to be virtually "flashless"—flash is held to a maximum of .001" on all units.

Dimensional stability is the main feature of the o-rings. Silic-O-Rings are offered from stock, for immediate delivery, in a range of very small sizes not normally available from conventional sources.

A. P. M. Corporation, 41 Honeck St., Englewood, N.J.

Use postpaid card. Circle No. 51

SELF CLINCHING FASTENER MEETS MILITARY SPECS.

An all-metal lock nut is clinched by a squeeze into prepared holes. It provides a rapidly assembled nut anchor in sheet metal, and it compensates for slight errors, up to 1/32" in alignment of mating holes.

They are available in sizes from No. 4 to ¼", and are suitable for sheet thicknesses from .040" up. Threads are class 3B, and meet military performance specifications MIL-N-25027.

Penn Engineering & Manufacturing Corp., Doylestown, Pa.

Use postpaid card. Circle No. 52

INSERT KIT FOR LABORATORY WORK

A kit of self-tapping inserts for use in experimental and prototype work includes a representative selection of various types and sizes of standard Tap-Lok inserts as well as seven different installations tools. With this material, the user can select, insert and test installations in woods, plastics or soft metals.

The kit is priced at $25.50.

Groov-Pin Corp., 1125 Hendricks Causeway, Ridgefield, N.J.

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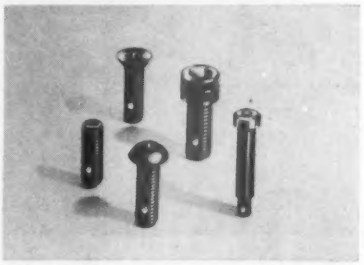
SELF-LOCKING SOCKET SCREWS ADDED TO LINE



A complete line of multiple-spline and hex socket screws with the Nylok self-locking insert are identified by a red nylon pellet. They are made in a wide variety of sizes and are applicable to all types of machines, machine tools, instruments, electronic components, and appliances of all kinds, particularly where the fastener must resist vibration.

The Bristol Co., Socket Screw Division, Waterbury 20, Conn.

Use postpaid card. Circle No. 54

APCO TORQUE TOOLS TO MEET EVERY REQUIREMENT

Apco Mossberg manufactures over 75 standard styles of torque tools ranging from an inch gram to 2000 foot pounds. In addition, they build many special tools for specific applications.

Every Apco torque tool is manufactured to rigid specifications to assure you the best available. They meet government standards, and are built to withstand 50,000 flexes without adjustment.

The Apco Mossberg Catalog of Torque Tools describes all styles, giving full information as to capacity, sizes and price. Write for your copy now.

- Special Purpose Wrenches
- Original Equipment Wrenches
- Torque Tools

APCO MOSSBERG COMPANY
215 Lamb Street, Attleboro, Mass.

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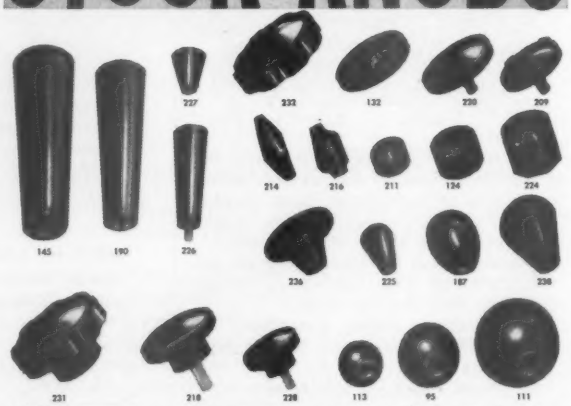
STOCK KNOBS ...NO TOOLING CHARGE!



Wide selection molded plastic knobs, handles, hand-wheels at no tooling charge! Minor changes (inserts, threads, color, etc.) to suit requirements. Other modifications give your part a look of exclusive design at fraction of new mold cost! Write for complete illustrated catalog, or see Sweet's Product Design Catalog File.

DIMCO-GRAY COMPANY
210 EAST SIXTH STREET — DAYTON 2 OHIO

Use postpaid card. Circle No. 245

With Eastman 910 Adhesive...

Strong neoprene-to-aluminum bonds in 2 minutes

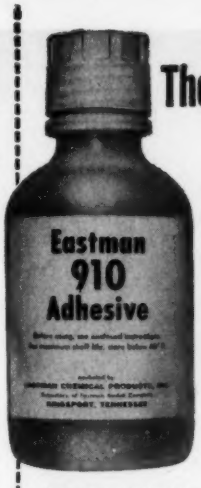
Take two aluminum tubes, one smaller than the other. Put one inside the other. At one end only, bond a neoprene ring between the two tubes. Got it? How long did it take you? Ames Rubber Company, of Hamburg, New Jersey, does it in two minutes when assembling the Redfield Gunsight Company's "Bear Cub Scope," a precision telescopic rifle sight. Ames uses Eastman 910 Adhesive. Over 25,000 units have been produced with no reports of bond failure.

Eastman 910 Adhesive will form bonds with almost any kind of material... fast, too.

Skeptical? Then send $5 for a trial kit and try it on *your* toughest job. Kits and further information are available from Armstrong Cork Company, Industrial Adhesives Division, 9108 Dunbar Street, Lancaster, Pa., or Eastman Chemical Products, Inc., Dept. A-8, Kingsport, Tennessee.

Here are the types of bonds that can be made with Eastman 910 Adhesive

Among the stronger: *Natural rubber, SBR, Buna N, most types of neoprene, steel, aluminum, brass, copper, most woods, vinyls, phenolics, cellulosics, polyesters, polyurethanes,* and *nylon.* Among the weaker: *polystyrene, polyethylene* and *fluoro-hydrocarbon plastics* (sheer strengths up to 150 lbs./in.²).



There is no adhesive like Eastman 910 Adhesive

Sets fast—Makes firm bonds in seconds to minutes.
Versatile—Joins virtually any combination of materials.
High strength—Up to 5,000 lbs./in.² depending on the materials being bonded.
Ready to use—No catalyst or mixing necessary.
Cures at room temperature—No heat required to initiate or accelerate setting.
Contact pressure sufficient.
Low shrinkage—Virtually no shrinkage on setting as neither solvent nor heat is used.
Goes far—One-pound package contains about 14,000 one-drop applications.
The use of Eastman 910 Adhesive is not suggested at temperatures above 175°F., or in the presence of extreme moisture for prolonged periods.

See Sweet's 1961 Product Design File 10d/Ea.

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Bridgeport TRADE MARK

GENUINE

CUSHION GRIP

SCREWDRIVERS

50% GREATER TURNING POWER

- Super Comfortable
- Non-slip Grip
- Unbreakable Handle
- Fully Guaranteed

Resilient Nitrile Rubber CUSHION GRIP lets you turn screws tighter with less work — reduces fatigue — increases productivity

Blisterproof — oil & water resistant Nitrile Rubber Grip permanently locked into tough amber handle.

New! Patented* INTERLOCK Handle. Cannot slip, slide, twist or come off.

Bolstered Blade winged shank for maximum strength

Blade of high grade chrome plated hardened alloy tool steel

Precision cross-ground point

Tested and acclaimed by electricians, automotive & industrial mechanics under actual working conditions

Available from Jobbers or write to manufacturer

19 sizes and styles. Regular points and Super Hard Phillips. $1.00 to $2.80 list. *Pat. No. 2871899

THE BRIDGEPORT HARDWARE MFG. CORP.
BRIDGEPORT 5, CONNECTICUT
Subsidiary of PUROLATOR PRODUCTS INC

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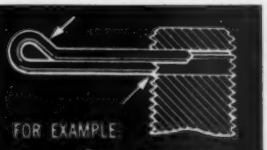
EVERY KIND, SHAPE, SIZE COTTER PIN

for any specific purpose or general mechanical use is manufactured by

WESTERN WIRE PRODUCTS COMPANY
1457 S. 18th • St. Louis 4, Mo.

Western Wire makes the largest and most complete line of cotter pins in the U.S. WW Cotter Pins are consistently accurate even in complicated shapes — designed and produced in strict accordance to specifications.

Write for prices and samples too, if wanted.



FOR EXAMPLE

Castle Cotter COTTER PINS

Expressly made for castellated, grooved and special nuts.

NO HAMMER DAMAGE TO VALUABLE FITTINGS

Fig. 1—Offset head countersinks with no forcing.

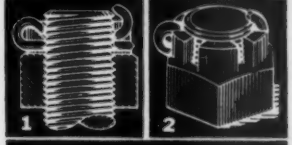


Fig. 2—Long prong is designed to clinch back to maximum "safe" position; holds nut securely.

SIZES AVAILABLE TO MEET ANY REQUIREMENTS FOR INDUSTRIAL, AUTOMOTIVE AND AIRCRAFT USE. AVAILABLE IN A-N 380 & 381 SPECS

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"Like a lot of other products I buy, I specify good old USA brand names because I can always rely on the consistent quality and availability of products that are here to stay. That's why Southern is my fastener."
Southern
SCREW COMPANY
STATESVILLE • NORTH CAROLINA
For quality fasteners, delivered on time—standardize on Southern. Contact your service-minded Southern Distributor, or write for current Stock List. Address: Southern Screw Company, P. O. Box 1360, Statesville, North Carolina.
Warehouses: New York · Chicago · Dallas · Los Angeles
MACHINE SCREWS & NUTS · TAPPING SCREWS · STOVE BOLTS · DRIVE SCREWS
CARRIAGE BOLTS · CONTINUOUS THREADED STUDS · WOOD SCREWS · HANGER BOLTS

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USEFUL LITERATURE

To receive your copy of any literature reviewed here, use the postpaid card opposite page 54.

LAMINATED PLASTICS

Techniques for machining laminated plastics are described in a new brochure. Eleven different hints for designing with laminated plastics, each with a detailed drawing, are presented in the brochure. Demonstrated are the right and wrong way of determining direction of loading in relation to laminations; location of punched holes and holes parallel to laminations; corners on punched parts; milled slots; irregularly shaped holes; location of insulating washers; fastening and joining; design of slot ends, and hints on tapped holes and tapped, blind holes. Synthane Corporation, Oaks, Pa.

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SILVER BRAZING

A data file, detailing procedures for torch brazing with Silvaloy low-temperature silver brazing alloys describes six steps for strong, leak-proof joints: Joint design, preparation for brazing, fluxing and assembling, heating and making the braze, cooling the work and flux removal, and inspection. Technical Service Dept., Engelhard Industries, Inc., 75 Austin Street, Newark 2, New Jersey.

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ELECTRICAL CONTACT USE

Latest techniques in the use and production of electrical contacts and contact assemblies are described in a new technical journal. The new periodical, will be published bi-monthly. It will describe electrical contacts made of tungsten, precious metals, and special alloys. Case histories are included. Plant production methods are described, including assembly mechanics and direct-welding, brazing, and sinter-fusion techniques.

Publications Dept., Fansteel Metallurgical Corp., North Chicago, Ill.

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SELF-RETAINING FASTENERS

Applications of self retaining fasteners in the automotive, appliance and aircraft industries are described in eight-page brochure. Illustrated in actual use are wiring clips, wire retainers, molding retainers and clinch nut ornamentation fasteners. Robin Products Co., 27027 Groesbeck Highway, Warren, Mich.

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ELECTRIC ASSEMBLY TOOLS

Automatic and semi-automatic electric assembly equipment and how they may be used for staking, swaging, riveting, punching, marking and terminal setting are described in 16-page catalog. Also included are lists of accessories for each piece of equipment. Black & Webster, Inc., 570 Pleasant St., Watertown 72, Mass.

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ADJUSTABLE DEPTH GAGE

A two-page bulletin describes and illustrates the universal adjustable depth gage handle.

The bulletin, 771, contains complete descriptions of the various applications of the depth gage handle, plus step-by-step operating instructions, complemented by illustrations. Heli-Coil Corp., Shelter Rock Lane, Danbury, Connecticut.

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REPORT ON BOLT TEST

A technical report, No. 1, describes the results of an elevated temperature torque test of NK 500 and NK 3 series of self-locking screws and bolts. These tests were performed at 350°F, 100° over the required temperature Spec of MIL F 18240A (ASG). Nylok-Western, 16222 Maple Ave., Gardena, Calif.

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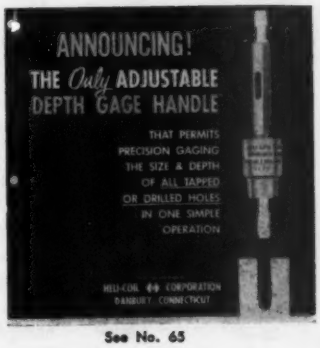
See No. 63

See No. 64



See No. 65

FIBER RODS AND TUBES

Information folder lists the properties of vulcanized fiber rods, sheets and tubes, and some product applications. Included in the folder are lists and charts which will give designers and project engineers considerable detail regarding the product's properties. Wilmington Fibre Specialty Co., New Castle, Delaware.

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REPORT ON BOLT FAILURES

A case for greater reliability in high-strength fastenings is contained in a laboratory report analyzing aircraft and missile bolt failure. The 16-page illustrated study, Report No. 495, gives data on ten actual failures. Each case consists of a generalized description of application, details of the failure and reasons why. Photos show type of bolting and metallurgical nature of failure. A. Roesler, Box 1121, Standard Pressed Steel Co., Jenkintown, Pa.

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ALLOY USER'S CATALOG

A user's catalog folder provides a handy and authoritative reference to standard and specialty products for welding, soldering and brazing. Helpful charts and tables summarize alloy selection. Product names and numbers are printed in bold-faced type for easy location. Fluxes are featured in a special section. All-State Welding Alloys Co., Inc., 249 Ferris Ave., White Plains, New York.

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TORQUE WRENCHES

Catalog filler sheets describe and give specifications for the sensory signaling torque wrench. Also included in the catalog are descriptions and specifications for company's complete line of wrenches and torque sensing devices, including the recently developed memory torque wrench. P. A. Sturtevant Co., Addison, Ill.

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ELECTRONIC CONNECTORS

An eight-page booklet describes a new system for three-dimensional modular packaging and interconnecting of electronic components. Called AMP-MECA (Maintainable Electronic Component Assemblies), it is described in detail. The characteristics and functions of the system, and the kinds of interconnections made possible because of modular-cell design, are discussed, with complementary illustrations. AMP Incorporated, Eisenhower Blvd., Harrisburg, Pa.

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VISE & CLAMP CATALOG

Manual and pneumatic vises and parts are listed in eight page catalog. Each item is photographically shown and described by stock number and price. Also included are the company's line of clamps and PowRarm work positions. Wilton Tool Manufacturing Co., Inc., 9525 Irving Park Rd., Schiller Park, Ill.

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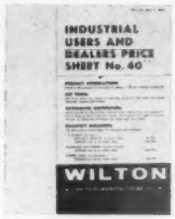

PRESSING & STAKING TOOL

Assembly tool that combines pressing and staking operations is described in bulletin CAS-2. Automatic and manual models as well as typical assemblies are illustrated. Independent press and stake force capacities, production rates

Need a fast solution to a fastener problem?

YOU GET INDIVIDUALIZED SERVICE FROM THOMPSON-BREMER

We are one of the few fully integrated manufacturers of Sems, lock washers, thread-cutting screws, terminals and cold-headed specialties. Since our engineering services and components manufacturing are together under one roof, we are particularly well able to give you fast, individualized service at competitive prices. We'll bid on your specials requirements, or fill orders for standard items on short notice from the extensive line of EVERLOCK products stocked by your local distributor. Send for catalog and samples or call your EVERLOCK representative.

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Thompson-Bremer & Co.
Division of
American Machine
& Foundry Company

Thompson-Bremer & Co.
Dept. 6126
228 N. LaSalle St.,
Chicago 1, Ill.

Please send me_____EVERLOCK fastener catalogs and_____sample sets of EVERLOCK industrial fasteners and cold-headed specialties.

Name_____ Title_____

Company_____

Street_____

City_____ Zone_____ State_____

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and work space dimensions for each model are illustrated. Machine Tool Dept., Cramer Division, Giannini Controls Corp., Centerbrook, Conn.

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WHEEL & ROLLER CONVEYORS

Photographs and diagrams illustrated in eight-page brochure describe principles and features of wheel and live roller, adjustable pressure conveyors. Product information includes specifications on length, width, height, belt speed, load capacities and other details of construction. The Rapids-Standard Co., Inc., 342 Rapistan Bldg., Grand Rapids 2, Mich.

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AUTOMATIC EYELET MACHINE

An automatic eyelet attaching machine which automatically feeds, sets, and resistance solders eyelets from .020" id to .125" id to printed wiring boards as thin as 1/64" is described in bulletin 611. Complete specifications for the unit are also given. Edward Segal, 132 Lafayette St., New York 13, New York.

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HEAVY DUTY COUNTER

A heavy duty mechanical counter, ideal for remote and difficult-to-see locations, is described and illustrated in a new bulletin. The unit has a wide variety of applications for manufacturers as listed in the bulletin. Full specifications and ordering instructions are included, as well as engineer's drawings, line drawings, and a large photograph. Veeder-Root Inc., 70 Sargeant St., Hartford 2, Conn.

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HOLE PUNCHING UNITS

Catalog covering the self-contained tooling line of hole punching units is specifically designed to help the reader not only choose the correct units for his particular application, but also to offer hints on mounting methods and shortcuts. Wales Strippit Inc., 241 S. Buell Rd., Akron, N. Y.

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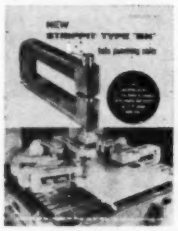
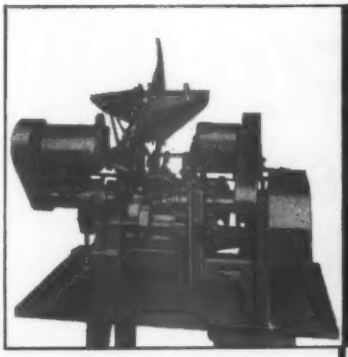


SILICONE APPLICATIONS

An eight-page two-color publication, CDS-288, has more than 20 photographs and charts giving valuable data and examples of silicones in use in a wide variety of electrical and electronic applications. Included are sections on silicone varnishes for impregnating and protective coatings, clear and opaque



TOWNSEND QUALIMATIC MACHINE OWNERS . . .

PROFIT thru SAVINGS

SAVE . . . lower first cost

SAVE . . . simplicity and economy of retooling results in indefinite lifetime

SAVE . . . often pay for themselves on initial job.

SAVE . . . automatic hoppers reduce individual labor costs.

SAVE . . . one man operates several machines.

SAVE . . . Precision performance eliminates scrap.

The H. P. TOWNSEND MANUFACTURING CO.
99 Brook St., West Hartford 10, Conn.

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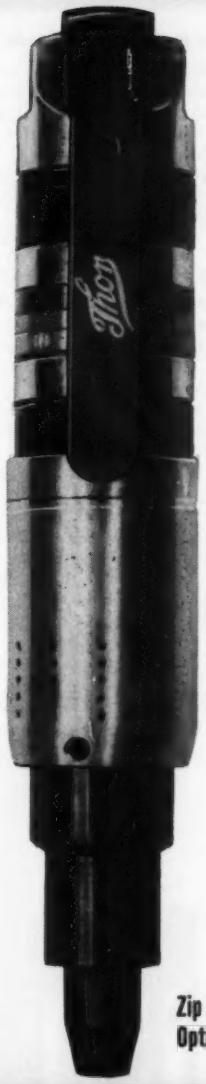
AIR-GARD SPEED REGULATOR



Zip Chuck Optional

Thor STRAIGHT-8

NO. 101 SERIES
AIR SCREWDRIVER WITH TWIN CLUTCH TORQUE CONTROL

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AURORA, ILL.

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potting and encapsulating materials, pressure sensitive adhesives, dielectric fluids, and wire and cable insulation. General Electric Co., Silicone Products Dept., Waterford, N. Y.

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WASHER-NUT ASSEMBLY

A new line of conical washer-nut assemblies for mounting silicon rectifiers and other stud mounting devices is described in catalog filler No. 121. Available sizes, series and material types are included. Shakeproof, Division of Illinois Tool Works, St. Charles Rd., Elgin, Ill.

Use postpaid card. Circle No. 79

PARTS HANDLING MAGNET

Fast pickup and release of screws, bolts, metals shavings, and delicate parts with three-way releasing hand magnet is described in information sheet. Specifications and price information are also included. Jess Corporation, Magnetic Products Div., 15770 Telegraph Rd., Detroit 39, Mich.

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VIBRATORY FEEDERS

Bulletin No. 308 contains specification drawings for pneumatic vibratory feeders. Included in the bulletin is a description of the feeder operation. National Air Vibrator Co., 435 Literary Rd., Cleveland 13, Ohio.

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MACHINERY MOUNTS

Complete line of machinery mounts are illustrated and listed as to the sizes and capacities available in catalog No. 4011. A section of the catalog is devoted to the results of tests conducted by a testing laboratory, showing the physical properties of the mounting material. Clark-Cutler-McDermott Co., Franklin, Mass.

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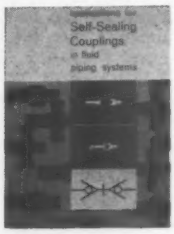

SELF-SEALING COUPLINGS

The uses of self-sealing couplings in fluid piping systems are described in bulletin No. 629. The 20-page booklet is devoted to a general discussion of the basic applications possible with the self-sealing couplings. It is illustrated with easy-to-understand drawings, and is prepared chiefly to acquaint the engineer or technician with general information rather than specific details. Aeroquip Corporation, Jackson Mich.

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HIGH PURITY SOLDER FOIL

A two-page data sheet JIZ-109, describes high purity precision solder foil. It includes complete specifications on solder foil, listing minimum thickness of .0005", widths to 6.00" maximum with tolerances on thickness held to plus or minus .0001". In addition to special alloys, the bulletin lists on page 2 data on 32 standard alloys available as foil. This data includes composition, softening and melting points. Accurate Specialties Co., Inc., 345 Lodi St., Hackensack, N.J.

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EPOXY PELLET ADHESIVES

Information folder No. 6 describes the characteristics and applications of Epoxy E-Form adhesive pellets. Bond strength; thermal, electrical and chemical characteristics; production line bonding techniques; and curing are discussed in separate sections of the bulletin. Epoxy Products, Inc., 137 Coit St., Irvington, N.J.

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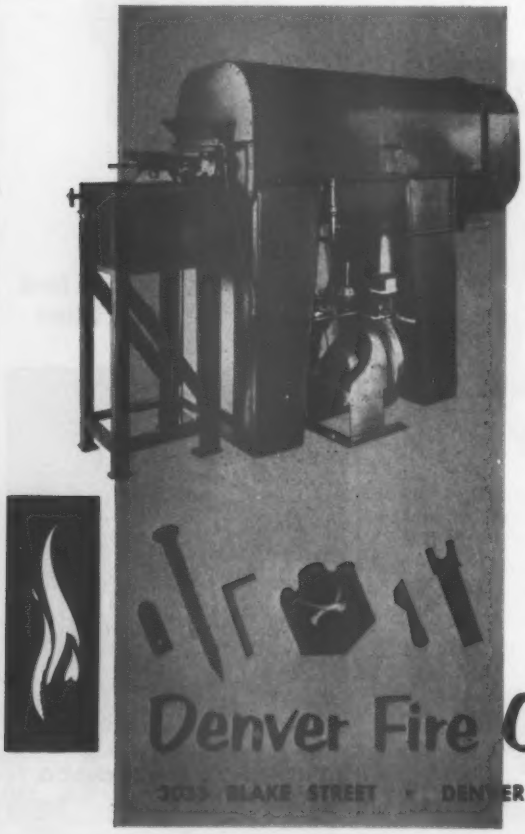
SELF-BONDING RUBBER

Illustrated technical bulletin describes self-bonding silicone rubber compounds. The four-page bulletin discusses applications for the new materials and describes in full the simple technique for obtaining primerless bonds to ferrous-containing metals. Also included are several charts and



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DFC makes SHAKER HEARTH Furnaces for your exact needs (420 to 1800 square inch, or larger, hearth)...of malleable inconel, rugged—durable.

Two zone temperature control and simple flow control adjustments, guarantee uniform results.

Whatever your application, a DFC Shaker Hearth Furnace will pay for itself in a short time. Lower purchase price...lasts longer...operates cheaper, low maintenance. Quenching tanks to your specifications.

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SALT LAKE CITY
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CHICAGO
LOS ANGELES

DF 1-5

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tables showing typical properties. General Electric Co., Silicone Products Dept., Waterford, N.Y.

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RIVET APPLICATIONS

A four-page brochure with sketches and photographs illustrates a variety of applications for Pop rivets in the building industry. A feature of the brochure is a sectional illustration of a building with 14 typical rivet applications described in detail. Pop Rivet Division, United Shoe Machinery Corp., Shelton, Conn.

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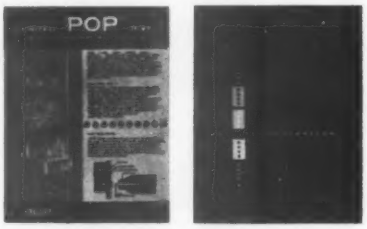

UNIT MECHANIZATION

An approach to automation based upon unit mechanization of specific or related work functions, rather than the fully automatic production line concept, is described and illustrated in a 12-page brochure. Included are typical examples of special automated machines which have been designed and built to perform various manufacturing, inspection, assembly, and testing operations on parts and components now being produced for use by the automotive, aircraft, appliance, electrical, and hardware industries. Jered Equipment Co., 1300 S. Coolidge Rd., Birmingham, Mich.

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SCREW MACHINE PRODUCTS

A four-color brochure illustrates 66 screw machine parts manufactured in one or more operations and more than 45 parts completed in one operation on a battery of fully automatic screw machines. Samples illustrated are from regular runs and have been held within 2½% A.Q.L. Merit Specialties Co., Dept. R, 205 E. Davis St., St. Louis 11, Missouri.

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MINIATURE SOLDERING IRONS

Information sheet gives complete details of miniature soldering irons. Charted for easy reference, each available model is fully described. Included also are prices for individual and quantity lots. Oryx Company, 13804 Ventura Blvd., Sherman Oaks, Calif.

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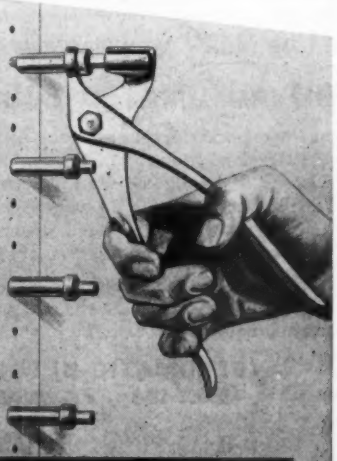
HIGH TORQUE FASTENERS

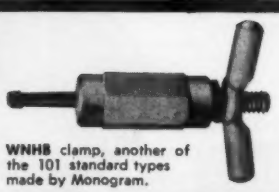
Use of a type of slotting configuration to increase torque tolerances by concentrating all the pressures around the axis of the fastener is described in four-page brochure. Included also is a

HOLD IT!

...better, faster, at lowest cost with Monogram Kleko Clamps

Stop wasting time and money with less efficient temporary fasteners and start solving all your sheet metal holding problems using MONOGRAM Kleko clamps and affixing tools. Write, wire, phone now for information on our 101 precision-engineered standard clamps for practically every temporary holding need during fabrication. And, if we don't carry the clamp you call for, we can make it faster, better to highest specifications.





WNHB clamp, another of the 101 standard types made by Monogram.

MONOGRAM Precision Industries, Inc.
8557 Higuera Street, Culver City, Calif., UP 0-6531

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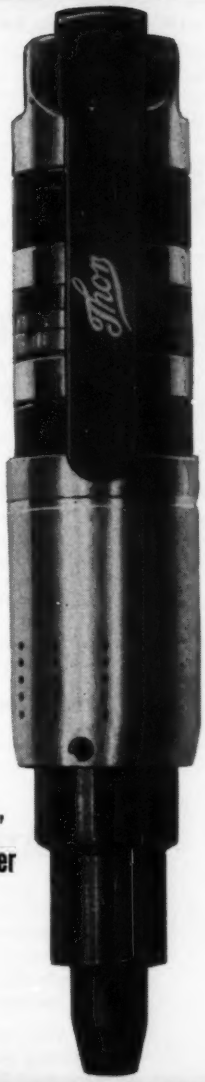
"PANIC BUTTON"
Instantaneous reverse



"Q.T."
Silencer

Thor
STRAIGHT-8
NO. 101 SERIES
AIR SCREWDRIVER
WITH
TWIN CLUTCH
TORQUE CONTROL

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list of presently made products using the high torque fastener. Aer-O-Line Manufacturing and Supply Co., 3110 Winona Ave., Burbank, Calif.

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FLAT RIM LOCK WASHER

Information sheet describes flat rim dish lock washer designed for switch and control unit applications. The washer can be used for fastenings of low strength material which may be brittle or soft. Shakeproof, Division of Illinois Tool Works, St. Charles Rd., Elgin, Ill.

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SPRING BUYERS GUIDE

Intended to assist both the design engineer and the buyer of spring components, a spring handbook fully illustrates and discusses the features of precision springs of every possible type. Four-slide parts, both round and flat wire forms and non-ferrous specialties are also covered. The Timms Spring Co., Elyria, Ohio.

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ELECTRICAL CONTACTS

A basic guide to electrical contacts includes charts covering applications and technical data for the various contact alloys and specifications of the most commonly employed stock contacts. Other sections of the guide discuss points to be considered in the design, specification and purchase of rivet contacts, laminated contacts, spring and blade components and complete assemblies. Tricon Manufacturing Co., 8010 S. Wallace, Chicago, Ill.

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BRAZING ALLOY

Two page engineering data sheet describes brazing alloy material, and lists its engineering and brazing properties. Recommended uses and an illustrated typical case history application is also included. Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich.

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LOCKING CAP SCREWS

Complete line of cap and set screws now equipped with Nylok are described in three-page catalog folder, DM 783. Specifications for the screws with information as to pellet location are given in easy-to-read reference chart. Bristol Company, Socket Screw Division, Waterbury 20, Conn.

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CLAMP CATALOG

Catalog 31-D includes complete information on prices, dimensions, shipping weights, typical applications, and other pertinent information for clamping and tooling components. Northwestern Tools, Inc., 138 Hollier Ave., Dayton 3, Ohio.

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STUD WELDING

How stud welding reduced the fastening costs for seven companies is illustrated and described in 12-page booklet. Each of the case histories is illustrated with the welding operation, and the parts assembled. Also included is a worksheet for determining cost reductions in fastenings. Nelson Stud Welding Div., Gregory Industries, Inc., Lorain, Ohio.

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PORTABLE CONVEYORS

Nylon wheel conveyors and aluminum roller conveyors that are light in weight, easily portable and quickly installed or interchanged in conveyor lines are described in four-page illustrated folder. Prices are included for

Something ***NEW*** *you should know about!*

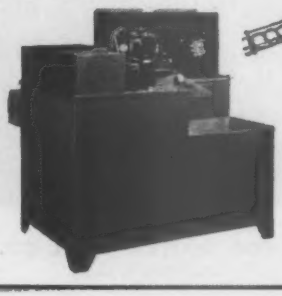
FEEDMATIC-DETROIT AUTOMATED EQUIPMENT

Now, you can speed small parts production and cut costs with new Feedmatic electrically controlled machines. These units automatically and continuously feed, inspect, segregate or assemble parts at greater efficiency . . . reduce handling costs on high volume operations. Use Feedmatic automated machines separately or for high speed delivery to machine tools, heat treating furnaces or final assembly areas.

If your operation involves the manufacture or processing of parts in volume quantities, it will pay you to investigate the cost saving advantages of Feedmatic automated equipment. *Send us your problem today!*

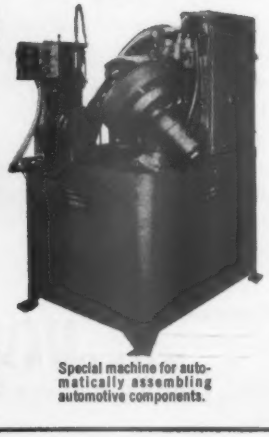
FEEDMATIC-DETROIT, INC.
P.O. BOX 115-B • SOUTHFIELD, MICHIGAN

Automatic Gaging Machine measures and sorts parts. Adjustable stops, anvils and gage heads to facilitate change over to different size parts. Tolerance of electrical gages adjustable from .0005 to .020.



Model 12F Floor Hopper. Parts storage capacity, 12 cubic feet. For automatic feeding of larger parts.

Rotary hopper unit. Fast, efficient parts feeding. Available in sizes from 8" to 24". Feed tracks engineered to meet specific job conditions.

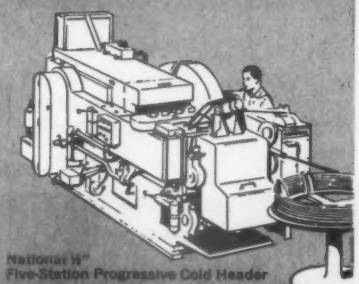


Special machine for automatically assembling automotive components.

These important parts are cold-formed from wire, start to finish in compact, efficient National Cold Headers.

Practically scrapless, all these parts achieve remarkable savings over past methods.

If you make odd-shaped parts, may we help you evaluate them for cold-forming from wire? Better yet, come to Tiffin, witness our demonstrations and let's discuss your work.



National "H" Five-Station Progressive Cold Header

NATIONAL MACHINERY CO.

TIFFIN OHIO U.S.A.

HARTFORD DETROIT CHICAGO

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12" to 24" wide conveyors and 90° curves with aluminum or steel frames. Harry J. Ferguson Co., 175 West Ave., Jenkintown, Pa.

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TORQUE RELATIONSHIP

A four-page folder describing methods of increasing the efficiency of threaded fasteners, discusses the relationship between applied torque and resultant clamping force in fasteners. Also included is a condensed catalog of torque tension testers, portable precision devices for evaluating bolts from No. 10 through 2½" diameter with load capacities to 225,000 pounds.

Skidmore-Wilhelm Manufacturing Co., 442 South Green Rd., Cleveland 21, Ohio.

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SEALS & TUBE FITTINGS

A compact, informative, reference circular gives applications, and other data dealing with o-ring seal with separate split-ring grip tube fittings. Features and advantages of the fittings, instruction for their use are covered in detail with drawings of their assembly and application. The Lenz Co., Dayton 1, Ohio.

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AUTOMATIC WELDING UNITS

Complete line of automatic welders, resistance and arc, are described in fourteen-page booklet. Included in the description are examples of how standard and special welders are now being used in various assembly operations. Arco Welder Manufacturing Co., 1719 W. Paul Ave., Milwaukee 3, Wis.

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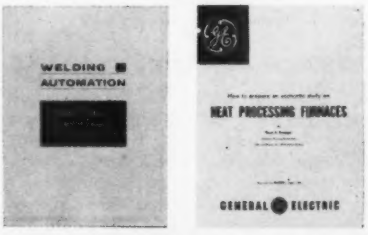

HEAT PROCESSING FURNACE

Bulletin GER-1751 is a four-page publication explaining how to prepare an economic study on heat processing furnaces. Text includes sections on where to obtain data, how to make the study, a table showing items to consider in the studies, and three typical examples. General Electric Co., Schenectady 5, N.Y.

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VISUAL CONTROL BOARD

Simplified visual control and scheduling is the subject of a twelve page booklet. The graphic presentation highlights the flexibility and ease of use as well as the advantages possible with the visual control or scheduling board. Memo Flex Division, 515 Bannock St., Dayton 4, Ohio.

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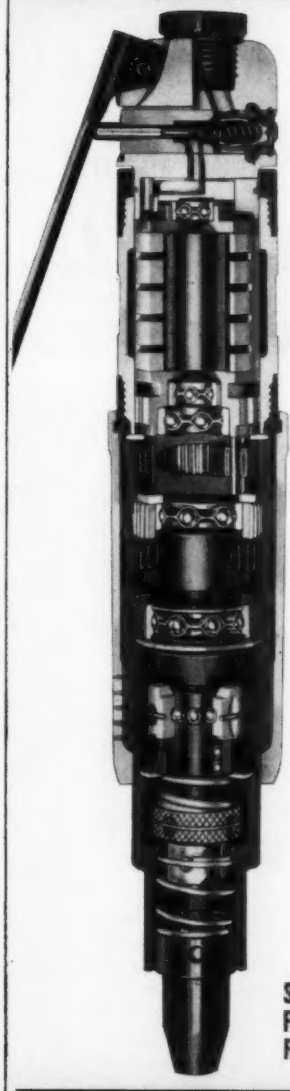
THOR-NADO AIR MOTOR
with 5-Blade Power Booster



Sure-Shot Fastener Finder

Thor
STRAIGHT-8
NO. 101 SERIES
AIR SCREWDRIVER WITH TWIN CLUTCH TORQUE CONTROL

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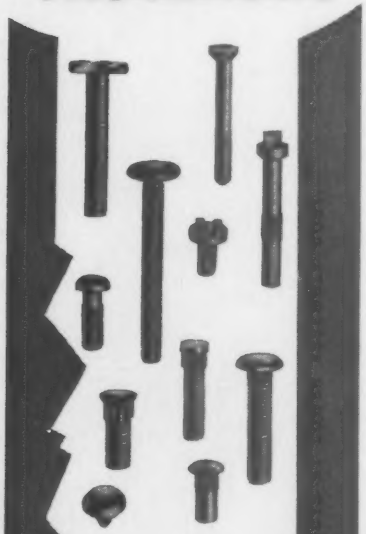
SECURE YOUR PRODUCT QUALITY with

HUBBELL

*COLD HEADED—ROLLED THREAD

FASTENERS



Hubbell c/h* turns out parts faster, better and at less cost than screw machining ever could . . . they're stronger, more accurate and more uniform.

Don't be a slave to screw machine waste! Check Hubbell c/h* today. Free part analysis. No obligation.

HARVEY

HUBBELL,

INCORPORATED

MACHINE SCREW DEPARTMENT

BRIDGEPORT 2, CONNECTICUT

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AIR POWER CATALOG

Air-powered devices for use in industrial applications including cylinders, valves, presses, clamps and work feeders are listed in 54-page air power catalog. Shown with each listing is complete description and engineering drawing. Mead Specialties Co., 549 W. Washington Blvd., Chicago, Ill.

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PORTABLE ELECTRIC TOOLS

Twelve page catalog G20, prepared in easy to read format illustrates, describes and lists prices of heavy-duty Drills, Sanders, Grinders, Hammers, Nut Runners, Polishers, Diamond Core Drilling Equipment . . . as well as a complete line of tool accessories. Milwaukee Electric Tool Corp., 5304 W. State St., Milwaukee, Wis.

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RIVET SETTING MACHINES

The use of rivets and the machines used for setting them are described and illustrated in four page brochure. Included also are engineering drawings showing typical rivet proportions for the split, deep-drilled, semi-tubular and shouldered rivet. Judson L. Thomson Manufacturing Co., Sawyer Rd., Waltham 54, Mass.

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WRENCH AND TOOL CATALOG

A 128 page catalog describes in detail complete lines of wrenches and hand tools for production assembly, ranging in scope from very small tools, suitable for production work in the electronic field, to the large wrenches required by heavy industry. The catalog also describes tools such as manual and hydraulic gear pullers, and electric drills. Snap-on Tools Corp., 8033 28th Ave., Kenosha, Wis.

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TORQUE INDICATORS

New handbook is designed to assist the engineer in selection and application of electro-magnetic brakes and clutches, mechanical clutches, torque indicators, torque standards and multi-speed transmissions. Manual No. 361 contains 60-pages of design specifications and design assistance. Autotronics Inc., Dept. 30, Florissant, Mo.

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Answer to problem on page 46. The merchant sold one grand prize at 10 cents. Nine individual game prizes at five cents each and provided 90 party favors at two for a penny.

COLD HEADING does it again!

Redesigned for Hubbell Cold Heading, this Brass Switch Handle is

STRONGER MORE EFFICIENT BETTER LOOKING

and only

1/2 THE COST!

What a difference compared to this old 2-piece screw machine and stamping method
Corrosion at joint caused breakage
Both ends drilled and shaved
End piece punched and pierced
Two pcs. joined by hand
Center post staked
Hubbell cold heading now makes the same part in one piece and it's stronger . . . lasts longer . . . costs far less. The customer has only one part to inventory and there's no replacement problem due to breakage.

If your operation uses large quantities of small metal parts formed on automatic screw machines, equal or greater savings may be possible with Hubbell Cold Heading.

HARVEY

HUBBELL,

INCORPORATED

MACHINE SCREW DEPARTMENT

BRIDGEPORT 2, CONNECTICUT

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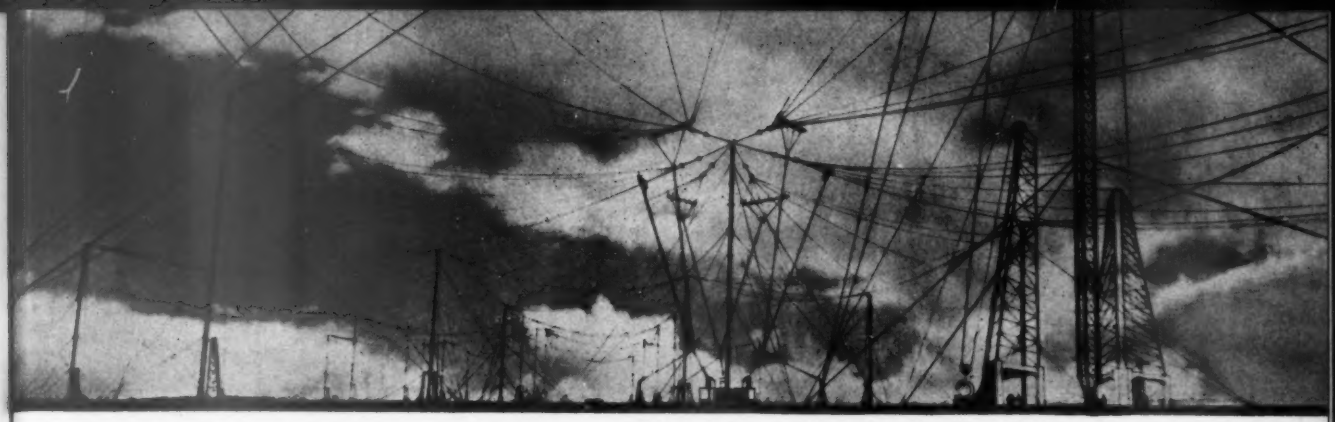
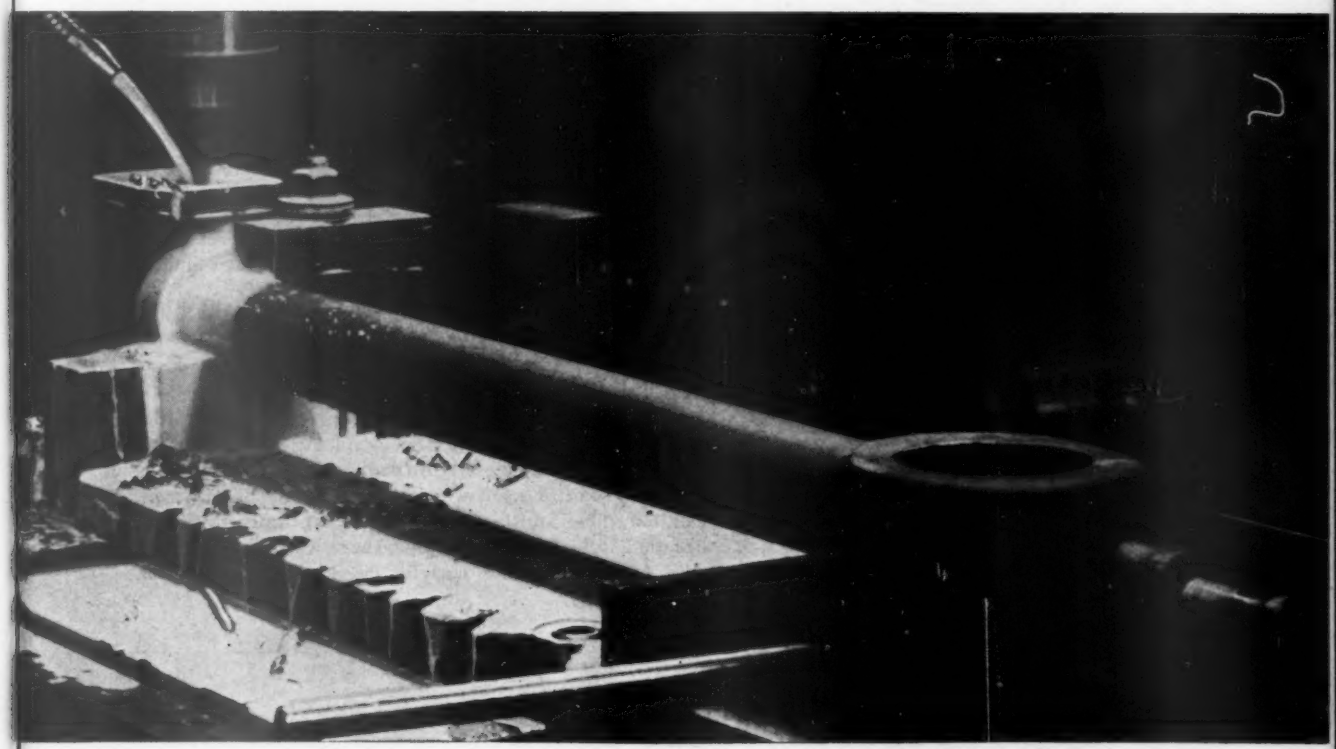


World's largest radio antenna contains 800 special Bethlehem eye-bolts



Husky eye-bolts, 800 of them weighing 75 lb each, are insulator-chain links guying the antenna of the most powerful radio station ever built. This specially engineered eye-bolt is typical of the special fasteners which Bethlehem manufactures in a wide variety.

This gigantic broadcasting station, located near Machias Bay on Maine's rock-bound coast, permits the U.S. Navy to reach submerged submarines half-way 'round the world.

Whether you need a tiny bolt with a special head . . . or a large-size "special" made to precise specifications, the chances are good that we can make it at an attractive price.

Just send a drawing or sketch of what you need, with a description of its application. Write or call the nearest Bethlehem sales office. Or get in touch with us at Bethlehem, Pa.

Steel *for Strength . . . Economy . . . Versatility*

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

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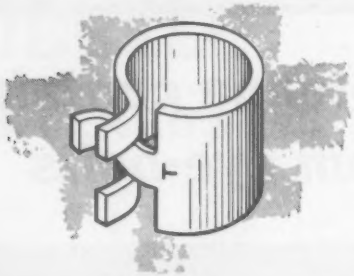
INFORMATIVE NOTES TO IMPROVE YOUR PRODUCT ...SAVE YOU MONEY

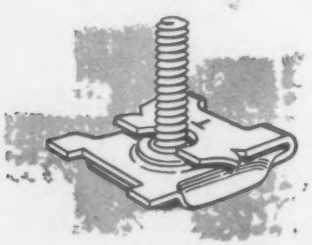
Published as a service to Designers and Engineers

Ideas from Tinnerman have cut costs, improved products. Here are examples from Tinnerman's 10,000 variations of SPEED NUT brand fasteners —all stamped with the T-mark of *total* reliability.

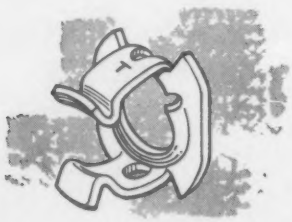
Tinnerman can help *you* cut costs with a free Fastening Analysis of your product. Call your Tinnerman representative, or write: *Tinnerman Products, Inc., Department 12, P. O. Box 6688, Cleveland 1, Ohio.*



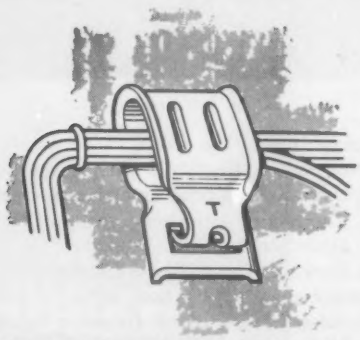
VERSATILE COMPRESSION RING has solved fastening problems in car radios, pressure gages, washers, and speaker cabinets. Simply squeeze compression fingers with pliers to expand . . . release, and spring tension maintains firm connection. Heat-treated spring steel of this SPEED CLIP® fastener won't lose tension, won't loosen under vibration. Possible applications are practically unlimited.



BOLT RETAINER used to fasten grille extensions to car fenders, has potential usage in any field where high-torque fastening is required on thin metal sections. This SPEED GRIP® fastener eliminates costly welding or staking, speeds assembly, allows savings in labor costs and parts handling. Barbs locate fasteners until nut is driven. One of Tinnerman's extensive line of SPEED GRIP nut and bolt retainers.



ELECTRONIC CONTROL CLIP retains tuning switch on chassis, gives constant spring tension for both push-pull and revolving controls . . . can be used wherever electronic controls are installed. This multipurpose SPEED CLIP fastener replaces threaded nuts, bushings, lockwashers. Cuts costs substantially. Live spring action lasts for the life of the equipment.

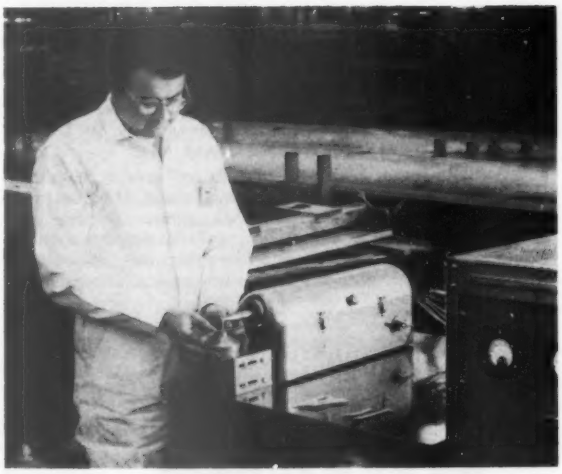


WIRE RETAINER is ideal for attaching single wire, light harness, cables or tubing. This SPEED CLIP fastener can be preassembled on the harness, allowing an entire wiring system to be snapped into place in seconds. Double embosses on upper clamping leg trap cold-flow tendencies of vinyl covered cord, assure 35 pound pull resistance. Clip will accept any wire or bundle up to .306" x .515".

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario. GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales. FRANCE: Simmonds S.A., 3 rue Salomon de Rothschild, Suresnes (Seine). GERMANY: Mecano Simmonds GMBH, Heidelberg.

Use postpaid card. Circle No. 249

INDUSTRY MAKES NEWS



Ultrasonic unit designed and developed by Boeing is used for joining parts in production of B-52H ballistic missile bomber.

BOEING DEVELOPS ULTRASONIC WELDER

An ultrasonic welding unit designed and built by Boeing Company, Wichita, Kansas, is being used in the production of the Strategic Air Command's new B-52H ballistic missile bomber.

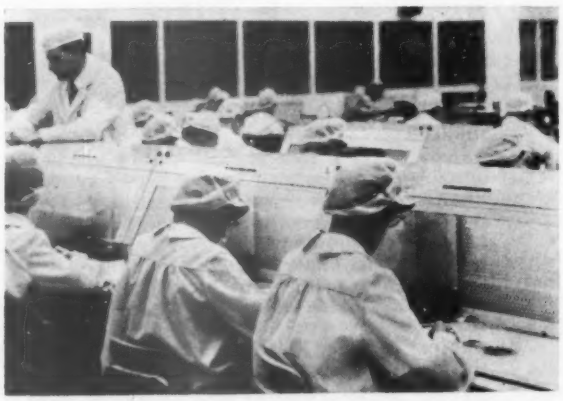
The welder operates directly from a 60 cycle power source, but the frequency is stepped up to 15,000 to 60,000 cycles with the acoustical energy actually doing the welding through rearrangement of the two metal surfaces into a common one.

MAY FASTENER SHIPMENTS

May 1961 shipments of industrial fasteners were 85% of the 1956-58 average, according to the Industrial Fastener Institute.

The substantial increase in shipments is the first upturn of fastener shipments since December, 1959, the report stated and the May figures represent an 11% increase over the first quarter average.

An index of industrial fastener shipments is issued each month by the Institute.



Dust-free cabinet provides controlled environment for assembly and testing of miniature components.

IMPROVED FILTER FOR DUST FREE UNITS

Redesigned Specialaire dust-free cabinets provide a high efficiency "packaged filter unit" which may be removed quickly for cleaning and replacement with minimum down-time and contamination. The illuminated work chamber is used to provide a controlled environment for assembly, test, research and repair of miniature precision components and instruments.

The packaged filter unit developed for the new Model B cabinet, assures uniform removal of small particles.

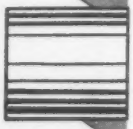
It was developed by Cambridge Filter Products for Specialties, Inc., Charlottesville, Va., manufacturer of the cabinet.

A feature of the cabinet design provides for a front hinged panel mounted at a 30° angle to reduce reflection. The panel is raised to insert large work pieces. For multi-cabinet installations, the units can be equipped with side openings for passing parts from one cabinet to another under protected conditions.

Send your toughest threaded *loosener* ~~fastener~~ problems to Nylok

We will analyze your problem and show you how inexpensive it can be to get the best and most economical insurance against equipment malfunction caused by loosening of threaded joints. This insurance is evidenced by the *billions* of Nylok-engineered fasteners now serving in thousands of applications. MIL-F-18240A (ASG) states that Nylok fasteners are recommended to replace lock-wiring in aircraft and missiles.

The key to the Nylok principle is this tough, elastic pellet that offers complete design versatility.



Only Nylok has the patented principle which can be applied to *any threaded joint* . . . male or female, any shape, any size, any material . . . to make it:

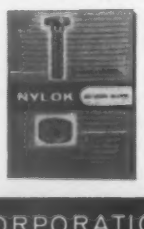
LOCK: against conditions of vibration and shock

SEAL: against fluid leakage along the threads

ADJUST: prevailing torque keeps it exactly where you wrench it . . . without being seated

Call Nylok at COlfax 1-9400, in Paramus, New Jersey, or send your problems to us at Dept. N2-28.

FREE DESIGN DATA
Circle the indicated number on the Reader Service Card, and we'll send you a copy of our 24 page catalog, giving complete, basic product and application data.



THE **NYLOK**® CORPORATION
611 Industrial Avenue, Paramus, N. J.
8048 Central Park Ave., Skokie Illinois
Nylok Western-16222 Maple Ave., Gardena, Calif.

Use postpaid card. Circle No. 262

The unit is finding increased application within controlled atmosphere "clean rooms", and in other manufacturing and assembly areas where special provision for environmental control is not provided.

J. L. THOMSON PROMOTES HERTZBERG

Irving Hertzberg has been appointed senior vice-president and member of the board of directors of the Judson L. Thomson Mfg. Co.

Prior to coming to Thomson, manufacturer of rivets and rivet setting machines, Hertzberg was president and director of the American Bolt & Screw Co., Oceanside, N.Y., a business which he himself founded. He was also president of Western Wire Co., New York City.

He was sales manager and production specialist at Globe Bolt and Screw Co., director of the Bristol Screw Co., and consultant for New York Screw Products and Superior Manufacturing Co.

He also holds patents on several fastening devices and fastening machinery.

DU PONT REDUCES ADHESIVES PRICE

Substantial price reductions on polyester type resins and adhesives for industry have been announced by the Du Pont Company's Fabrics and Finishes Department.

Reductions ranged from 25 to 40% on three terephthalate copolyester resins in solid form, available either as bricks or as chopped material, for use in compounding finishes, sizes, adhesives, printing inks, and other coating compositions. Prices were reduced by 14% and more than 11%, respectively, on two metallic yarn adhesive solutions and from eight to more than 39% on 27 other solutions.

SHELTON RIVETS

QUALITY • SERVICE • ECONOMY

Shelton has effectively demonstrated its techniques and practical solutions to creative problems in rivets of all types. A sense of personal responsibility and quality control is the prime asset of this company. It is our desire to serve, secure and retain customers, whether they use 25,000 or 25,000,000 rivets, through an attitude of helpful service. We will consider it a privilege to be invited to discuss your needs.

THE SHELTON TUBULAR RIVET CO., Shelton, Conn.

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BRISTOL NAMES SCREW SPECIALIST

The Socket Screw Division of The Bristol Co., has announced the appointment of Andrew E. Allis as their Nylok socket screw specialist.

Allis has been with the Company for eight years as a sales engineer. His new responsibilities will be to coordinate sales, to assist in engineering and developing new applications for Nylok socket screws, and to assist the district representatives throughout the country.

Allis will make his headquarters at Bristol's home offices in Connecticut.

WELDING SOCIETY MEETING IN DALLAS

The latest technological developments in the fabrication and assembly of metals will be reported through a series of papers to be delivered at the national fall meeting of the American Welding Society which will be held in Dallas, Texas, September 25-28, 1961.

AWS has taken a step toward solving the serious problem of duplicate research efforts by assuming the role of a central clearing house for scientific projects within its field.

ILLINOIS TOOL BUYS AUSTRALIAN CO.

Illinois Tool Works, Chicago, has acquired an ownership interest in W. A. Deutsher Pty. Ltd., in Victoria (near Melbourne) Australia. Deutsher, established in 1921, is a major Australian producer of screw machine parts, such as valve fittings and industrial fasteners. Relationship between the two firms began several years ago when Deutsher was granted a license for the manufacture and distribution of certain of ITW's fastening products. Deutsher will produce

Many large volume users of solid pins for electronic and mechanical purposes have cut costs by switching to Multi-Swaged *tubular* pins . . . without sacrificing strength or accuracy. Multi-Swage parts serve as terminals, contacts, bearing pins, stop pins, male-female connections, etc., in a wide variety of products such as Business Machines, Ventilator Louvres, Toys, Radio and Television Apparatus, Terminalboards, Electric Shavers, Phonograph Pickups, etc. Send part (up to ¼" dia. and to 1½" length) and your specs for a quotation. Or write for DATA BULLETIN.

The BEAD CHAIN® Mfg. Co.
208 Mountain Grove St., Bridgeport 5, Conn.

Manufacturers of BEAD CHAIN — the kinkless chain of a thousand uses, for pull and retaining chains and other industrial uses; plumbing, electrical, jewelry, fishing tackle and novelty products.

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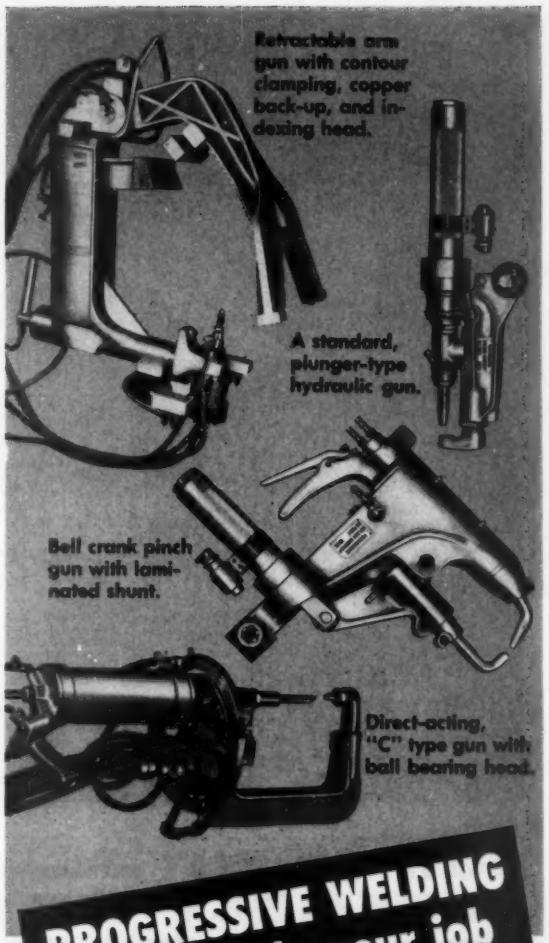
Retractable arm gun with contour clamping, copper back-up, and indexing head.
A standard, plunger-type hydraulic gun.
Bell crank pinch gun with laminated shunt.
Direct-acting, "C" type gun with ball bearing head.

PROGRESSIVE WELDING GUNS will do your job BETTER, for LONGER!

Standard or special built, mammoth or midget, there are more Progressive Welding Guns used today than all others combined—the reason is quality at lowest possible cost.

Progressive's portable guns are engineered for top efficiency and dependability, built of quality materials for longer service life and comprised of standard, interchangeable parts for greatest economy.

Special or standard, there is a Progressive Welding Gun for your job. Your inquiries are invited.

PROGRESSIVE WELDER & MACHINE CO.
915 Oakland, Pontiac, Mich.

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IMPORTANT NEWS FOR SILVER BRAZING PREFORM USERS
NEW "CLOSE CLUSTER" DIE PROCESS CUTS BRAZING PREFORM WASTE, SAVES YOU MONEY!
Scrap means waste. And that adds to the cost of your silver brazing preforms. Precision dies arranged in a "close cluster" make maximum use of every inch of silver brazing or precious metal strip. This cuts waste, saves you money. Developed originally by Alloys Unlimited for the semiconductor industry, this new technique of "close cluster" stamping makes other methods old fashioned. Start saving . . . Send us your specifications, then compare our bids with your present costs. No obligation, of course.
ALLOYS UNLIMITED INC.
Alloys Unlimited Inc. 21-01 43rd Ave. Long Island City 1, N. Y.

Use postpaid card. Circle No. 266

HOW TO CUT ASSEMBLY TIME AND COSTS!

. . Ask National! Years of producing the world's lowest cost in-place fasteners assures you of qualified assistance in obtaining fastenings that will cut costs and speed assembly!

THE FOUR BIG ADVANTAGES NATIONAL OFFERS

★ **Engineering Service**
National is Headquarters for fastening problems. By the same token, National is Headquarters for fastening solutions!

★ **Low Equipment Cost**
Buy or lease depending upon the job or capital requirements.

★ **Quality Rivets**
National has the facilities and equipment to give you the right rivets for lowest cost in-place fastening.

★ **Speed of Assembly**
Automatic riveting equipment can be used with excellent speed and results even by unskilled or semi-skilled help!

Send a blueprint or product itself to National for a prompt and dependable answer to your assembly problem.

Bulletin No. 137 describes and lists industrial rivets. Write for your copy.

NATIONAL RIVET & MFG. COMPANY
211 MAIN STREET • WAUPUN, WISCONSIN

Use postpaid card. Circle No. 267

an expanded line of Shakeproof and Fastex fasteners for the automotive, appliance, and electrical industries in Australia—the same major industries serviced by ITW and its several divisions here in the states.

GRIES REPRODUCER APPOINTS R. E. JONES

As part of a new expansion program for increased customer service, Gries Reproducer Corp. has appointed Ronald E. Jones, as GRC sales representative to the original equipment market in Connecticut.

Jones will market GRC stock components, as well as specialized tiny die castings and plastic moldings made on contract.

OMARK NAMES MARKETING MANAGERS

Donald Walker has been named market research manager, and Don Berlinguette advertising manager at Omark Industries.

Walker has been with the company since 1956 and served as assistant personnel manager until his appointment as advertising manager in 1958.

For the past six years, Berlinguette has been advertising manager for Omark Industries, Ltd. in Ontario, Canada. In his new assignment, he will be responsible for advertising for the company's saw chain and fastening divisions in the U. S.

PORTOMAG, GENERAL AUTOMATION MERGER

Through the merger of Portomag, Inc., and its Di-Cor division and General Automation Co., a new company, General Automation Manufacturing, Inc., has been formed. The

TECHNICAL ARTICLE REPRINTS AVAILABLE

- Fasteners in The Space Age—Nov. 1958
- Torque Considerations in Design—Jan. 1960
- Which Thread—Coarse or Fine?—Feb. 1960
- Designing for Silver Brazing with Preforms—Apr. 1960
- When and Where to Use Custom Fasteners—May, 1960
- Resistance Welding Stainless Steel—June, 1960
- The Selection and Use of Adhesives—Aug. & Sept. 1960
- How Lubrication Affects Torque-Tension Relationship—Sept. 1960
- Will Audio-Visual Systems Obsolete Assembly Lines—Nov. 1960
- Friction as a Factor in Bolt Tension—Jan. & Feb. 1961
- High Pressure Self-Sealing Fasteners—Feb. 1961
- Selecting Power Drivers for Threaded Fasteners—Feb. & March 1961
- The Role of Joint Design in Furnace Brazing—May 1961

Single copies of individual reprints are free upon letterhead request. Additional copies of each reprint are 15 cents apiece.

Reader Service Department

ASSEMBLY & FASTENER ENGINEERING
Wheaton, Illinois

new firm, located in Troy, Mich. produces special automated machinery and equipment.

Principal officers of the new company are: R. R. McLeese, president and former president of Portomag; R. S. Ebbert, vice president-marketing and former vice president of Portomag and H. C. Ovshinsky, vice president engineering and manufacturing and former president of General Automation Co.

NATIONAL SCREW PROMOTES THREE

BAKER

LAWRENCE

OHLRICH

New appointments announced by the National Screw & Manufacturing Co., Cleveland, Ohio include those of Charles W. Baker as assistant to the president, F. W. Lawrence to director of technical sales and research, and Harry E. Ohlrich to regional sales representative for Cleveland and northwestern Cuyahoga county.

Baker, now in his 49th year with the company, has been director of technical sales and research for the last 11 years. He had served as chairman of the Aircraft Fasteners Committee, and as a member of the Screw and Bolt Standards Committee of the Industrial Fastener Institute.

Lawrence joined the company in 1954 as special technical sales representative.

Ohlrich has been a member of the company's sales department in Cleveland for two years.

MINIATURE HEADLESS SLOTTED SET SCREWS

. . . put your needs in MOORE'S capable hands

Wherever you require *precision* miniature headless slotted set screws, you can depend on Moore to meet your requirements to complete satisfaction. Prices are right. Delivery is fast. And quality is to the highest industry standards. Available in sizes #0 through #4 in a wide selection of materials, finishes, lengths and points.

Specify Moore and be sure. Dependable quality for over 80 years. Write for price catalog.

MOORE SET SCREWS

George W. Moore, Inc.
since 1880
91 Beaver St., Waltham 54, Mass.

Use postpaid card. Circle No. 268

GRIPCO TOPLOCK NUT
One piece all metal
GRIPCO CLINCH NUT
With or without self-locking threads. Hex collar prevents turning when torqueing bolt.

You get these "extras" when you specify GRIPCO®

GRIPCO PILOT PROJECTION WELD NUT
With or without self-locking threads. Centering collar positions nut and protects threads from weld spatter.

FASTENERS—

Service—40 sales representatives all over the country for prompt, fast service.

Reliability—Quality controlled by the oldest established lock nut manufacturer in the U.S.

Stock—Large inventories to ensure out of stock delivery on all catalogued items.

Speed production and lower costs on your products with this GRIP NUT family of GRIPCO FASTENERS. Qualified fastener engineers are available for consultation on all your assembly problems. Consult the yellow pages in your phone book under "GRIPCO" for the one nearest you.

GRIPCO CENTERLOCK NUT
Locking feature in the center for fast feeding. Can be applied from either end.
GRIPCO COUNTERSUNK WELD NUT
With or without self-locking threads. Countersink protects threads from weld spatter.

Other Gripco Products:

- Brass Toplock or Centerlock nuts.
- Miniature weld and clinch nuts, with or without lock.
- Toplock and Centerlock Hi Nuts.
- Standard Semi-finish full and jam nuts.
- Stainless Steel lock, weld and semi-finish nuts.
- Cold formed special nuts or parts to print.

Send for samples and NEW CATALOG today

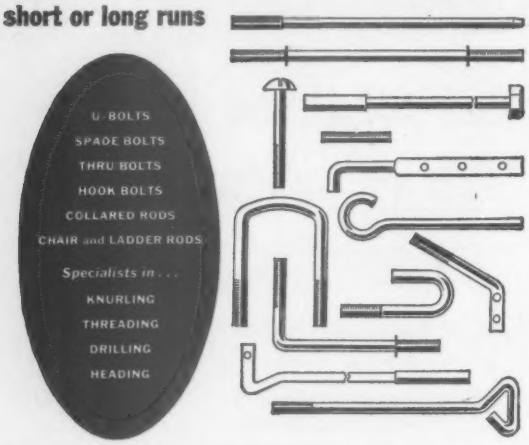
GRIP-NUT COMPANY 125

113 MAPLE AVE.
SOUTH WHITLEY, INDIANA
Phone: South Whitley 723-5111

Subsidiary of Heli-Coil Corporation, Danbury, Conn.

Use postpaid card. Circle No. 269

Complete Facilities for the manufacture of Special Headed and Threaded fasteners / from 1" to 60" in length in short or long runs



Send drawings or blueprints for quotes and literature.

OHIO ROD PRODUCTS CO., INC.

20265 1st AVENUE • BEREA, OHIO

Use postpaid card. Circle No. 270

58,900 LBS.

That's the *minimum* you get with half-inch diameter Driv-Lok Shear-Proofs. Through all diameters, these remarkable pins give you twice the shear strength of ordinary pins, whether solid or spring type. Installation? Just drill and drive!

Compare for Yourself

For versatile, economical and *positive* fastening, specify Driv-Lok. Give us a call, or write for your free catalog today.

Standard Type A Shear-Proofs (shown) are stock. Samples available on request.

MINIMUM SHEAR VALUES IN POUNDS			
Diameter	Slotted Spring Pins	Coiled Spring Pins HEAVY DUTY	Shear-Proof DRIV-LOK PINS
3/32"	1000	1030	2040
1/8"	2100	1840	3690
5/32"	3000	2880	5720
3/16"	4400	4140	8240
1/4"	7700	7360	14720
5/16"	11500	11500	22960
3/8"	17600	16580	33160
7/16"	20000	22540	45000
1/2"	25800	29440	58800

DRIV-LOK SALES CORPORATION

731 Park Avenue • Sycamore 2, Illinois

Use postpaid card. Circle No. 271

CHICAGO PNEUMATIC NAMES NEW OFFICERS

COFFEY

READMAN

Guy J. Coffey has been named chairman of the board and chief executive officer of the Chicago Pneumatic Tool Co., New York. He succeeds H. Arnold Jackson who will continue as a director and chairman of the executive committee.

Norman Readman has been elected president to succeed Coffey. Readman was formerly managing director of all overseas operations of the company. He joined Chicago Pneumatic in 1943 as secretary of the wholly-owned subsidiary, Consolidated Pneumatic Tool Co. Ltd. He was appointed a director of the subsidiary in 1947, and became its managing director in 1953.

Other appointments announced by the company were: Thomas F. Noonan elected vice president and comptroller and Carra L. Lane, elected vice president and manager of plant operations.

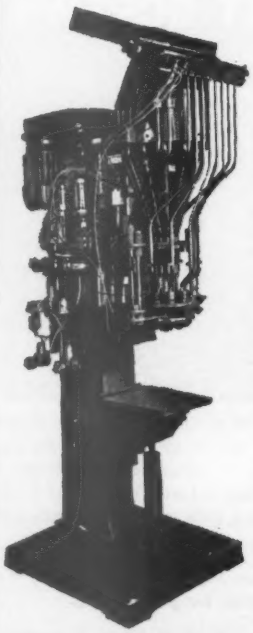
DEUTSCH APPOINTS WESTERN DISTRIBUTOR

Marshall Industries, San Marino, Calif. has been named as a stocking and assembling distributor for the Deutsch Co., Electronic Components Division, in the eleven western states.

Marshall Company facilities in both San Marino and Monrovia, Calif. will be utilized for the assembly, testing and shipment of the entire line of Deutsch miniature-environmental, electrical connectors.

In addition, they will warehouse a complete inventory of Deutsch accessory hardware for off-the-shelf delivery to western customers.

this machine will drive up to 10 screws at one time . . .



. . . reducing assembly costs and improving quality. Built for high production jobs where a fixed set up is practical, this multiple spindle screw driving machine automatically feeds screws from a hopper and drives them to a predetermined torque. Evenly distributed pressure eliminates stresses caused by driving home one screw at a time. A simple sliding fixture positions work pieces accurately.

Machine illustrated shows application of multiple spindle screwdriving to assembly of electric power drills.

Send a sample of your assembly and a list of your requirements. We will be happy to show you how multiple spindle screw driving can be applied to your job.

COOK & CHICK COMPANY

2415 West 24th Street Chicago 8, Illinois

Use postpaid card. Circle No. 272

FASTENER COMPANY ADDS NEW PRODUCT

Pioneer Screw & Nut Company, Melrose Park, Ill. has announced the addition of a new "rocket point" tapping screw to the line of fasteners which they manufacture.

Arnold Haram, recently named vice president in charge of sales, and Howard Unger, vice president and general manager, worked together to develop Pioneer's facilities for production of this new product.

NAMED TO CHIEF EXECUTIVES FORUM, INC.

The Chief Executives Forum, Inc., at its annual meeting in Palm Beach, Fla., honored Rene D. Wasserman, chairman of the board, Eutectic Welding Alloys, by nominating and electing him to officership on its Executive Committee.

The membership of the Chief Executives Forum is restricted to the alumni of the Young Presidents' Organization, Inc., in which Wasserman has been active for many years.

The purpose of the Chief Executive Forum, are to develop and promote the exchange of American business management ideas, experiences and practices and aggressively develop and support individual incentive, but not to carry on propaganda or influence legislation.

ALLOYS UNLTD., JAPANESE CO. AGREEMENT

Alloys Unlimited, Inc., producers of semiconductor materials, entered into a technical and selling agreement with Sumitomo Shoji Kaishi, Ltd.

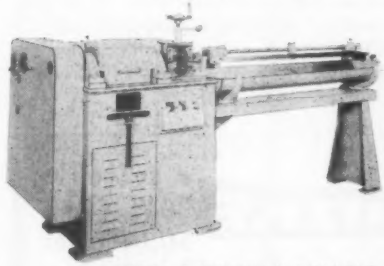
Under the agreement, Alloys Unlimited will advise Sumitomo on the production of spheres, pellets, and base tabs. In return Sumitomo will pay Alloys Unlimited $50,000 down payment and royalties on all sales of these items for the next seven years.

$HUSTER DOLLAR $AVER

STRAIGHTEN AND CUT A TON OF SMALL DIAMETER WIRE A DAY . . . EARN THE PRICE OF THIS MACHINE IN ONLY 16 WEEKS.

1V18 Shuster Production Booster

Capacity .062" To .125"



Compare
$2595.00
HIGHEST PRODUCTION
LOWEST PRICE

WITH INFINITE VARIABLE SPEED

PRODUCTION 25 TO 150 F.P.M.

12000 CUTS PER HOUR TO 8"

• New electro-mechanical positive release target eliminates jamming • High speed straightening arbor boosts production • Timken bearing equipped feed-roll housing • Larger catch pan • Ideal working height.

METTLER MACHINE TOOL INC.
Boulevard Industrial Park
New Haven, Connecticut
Use postpaid card. Circle No. 273

COLD IMPACT EXTRUSIONS

Typical Extrusions

In steel, brass, aluminum and stainless steel.

Material savings, through moving rather than removing metal, and higher strength gained through cold working result in substantial economies in high production items, such as, bearing races, fittings, cylinders, shells, etc.

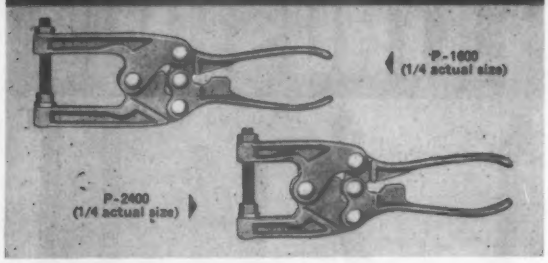
JACOBSON NUT MFG. CORP.
Kenilworth, New Jersey
Use postpaid card. Circle No. 274

Available in Stainless Steel, Brass, Aluminum and Steel

JACOBSON NUT MFG. CORP. KENILWORTH, N.J.

Use postpaid card. Circle No. 275

Another step forward
***KNU-VISE* TOGGLE PLIERS with**
1600 & 2400 lbs. clamping force



In keeping with its reputation for providing the industry's most efficient toggle clamps and pliers, Lapeer Manufacturing Company has introduced new plier models—the P-1600 and P-2400 series.

Long and comfortable handles are a feature of these Lapeer Knu-Vise pliers. With average handload, these pliers provide a clamping force of 1600 and 2400 lbs. respectively. The P-1600 series has a throat depth of 2¼", and throat gaps of 1 3/16, 3, 4 and 6 inches. The P-2400 series has a throat of 1¼" x 1¼". Each series is available with two opposing spindles. All models can be furnished with unlocking levers. The pliers are made from steel forgings, heat-treated, and cadmium plated.

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ROTOR TOOL ORGANIZES CANADIAN CO.

The organization of a wholly-owned subsidiary in Canada, the Rotor Tool Co. of Canada, Ltd. has been announced by Rotor Tool Co., Cleveland, an affiliate of Cooper-Bessemer Corp.

The new company will have its headquarters in Rexdale, Ontario, a suburb or Toronto.

Allen W. Barnes, formerly sales engineer with a power tool firm in Pittsburg, will be in charge of the Canadian company's service facilities.

Richard Allchin, president of Rotor Tool, will be president of the new subsidiary. Allchin was recently elected as chairman of the board of directors of the Wellman Bronze & Aluminum Corp.

NAMED TO SHUR-LOK BOARD OF DIRECTORS

Leo A. Pfankuch, president of the Shur-Lok Marine Corporation and a director of Telecomputing Corporation, has been elected to the board of directors of the Shur-Lok Corp. Pfankuch is associated with many professional and welfare organizations.

He will assist in the direction of activities of Shur-Lok Corp.

PYLES PURCHASES CALIFORNIA DISTRIBUTOR

Pyles Industries, Inc. of Detroit, has announced the purchase of their California distributor, Pyles West Coast, Inc. Pyles will operate this facility as a factory branch with complete demonstration, service and stock facilities. W. H. Weishaupt has been named manager of the branch.

Spyraflo, Inc., subsidiary of Penn Engineering and Manufacturing Corp. has begun operation of their new plant located in the Sunshine State Industrial Park, N. Miami, Fla. The company will be devoted to research and development of mechanical parts and specialties for electrical and miniaturized electronic components, instrumentation and guidance and control systems.

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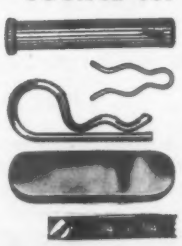

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APPOINTMENTS AT DENISON ENGINEERING

The appointment of a district manager and four field engineers have been announced by Denison Engineering Division, American Brake Shoe Co., Columbus, Ohio.

Lawrence M. Krebs has been named manager of the Michigan district, and will have his offices in the company's district office in Troy, Mich.

The four field engineering appointments were: James C. Jones, eastern Michigan; Richard L. Van Voorhis, Ohio; Robert D. Arthurs, Chicago; and James H. Woodward, Jr., southern Ohio and northern Kentucky.

ADHESIVES MGR. FOR REICHHOLD CHEM.

Hippocrates G. Psyras has been named manager-adhesive emulsion technical service for Reichhold Chemicals, Inc., New York. He will be responsible for sales and technical service activities in the adhesive industry. In addition, he will assist in the development of new emulsions for use by this industry.

Prior to joining Reichhold he was associated with the Union Paste Co., E. I. duPont de Nemours & Co., and U.S. Rubber Co.

DIRECTORS ELECTED AT UNITED-CARR

Edward P. Taylor and Vincent R. Herterick have been elected to the board of directors of United-Carr Fastener Corp., Boston.

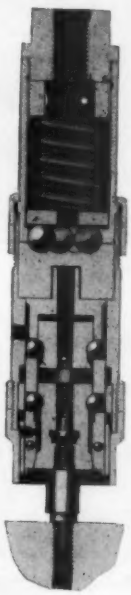
Taylor is vice president for finance of United-Carr Fastener Corp., and Herterick is president of the Carr Fastener Co. He is also division and general manager of the New England division of the corporation.

NEW

Controlled (Torque) Drive

STUD DRIVER

. . . for Stud Driving applications requiring limited torque while driving the stud



A necessity where a limited amount of torque is desired—as in driving shoulder studs.

As shown in the sectional view, this new tool has an adjustable over-running clutch so that the stud can be driven to any predetermined torque. Simple adjustment is made by removing the two Allen screws in the spring adjusting nut (directly above spring) and moving it downward for increased torque, or upward for decreased torque. It is not necessary to stop rotation at any time while driving studs. Other outstanding Titan Stud Driver features are an automatic take-up for jaw wear, and an inexpensive method of changing the cam ring.

While not designed for use with impact wrenches it is an ideal tool for use with any air or electric drill or drill press at constant speed. Available in sizes No. 101, No. 102 and No. 103.

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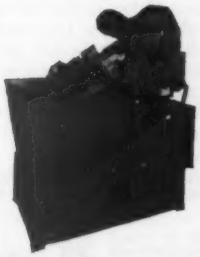

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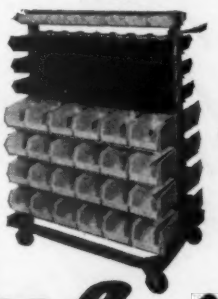

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How semitubular rivets facilitate assembly of subminiature switches.

32—How to Prepare Audio-Visual Instruction
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37—Higher Quality Work with Better Light
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New line at Western Electric turns out 1200 finished units an hour.

41—Industrial Robot Does Repetitive Tasks
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Considerations for proper heat treat, fit, and usage.

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Eliminates 90% of handwork on automobile radiators.

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Fast-drying adhesive permits quick-bonding of parts

22—Data Units Check Component Quality
Designed to help automate industrial quality control.

22—Brazing Cuts Stapler Assembly Costs
Use new alloy in conjunction with automatic fluxing system.

24—Welding of Heat Transfer Fins
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26—Locknuts Machined in 29% Less Time
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New ARMSTRONG General Catalog No. 700, showing the complete ARMSTRONG Line including approximately 330 new ARMSTRONG tools added in these categories:

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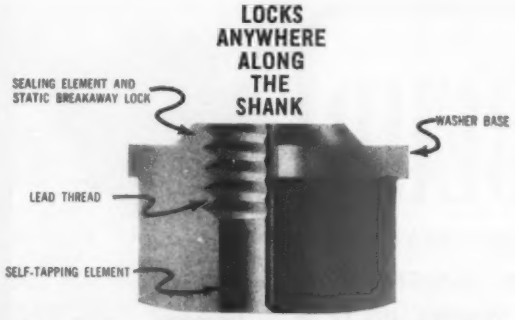

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Valuable engineering data on standards, finishes, strength of joints, torque, materials and other subjects will be included in tables and chart form.

A special trade name section will list products commonly known by their trade names, describe the products and identify the manufacturer. Another section on associations will contain an up-to-date list of important trade and professional groups serving the industry.

The Directory will be bound in hard covers, measures 8½ x 11½ inches, and is planned to answer many questions with which you are confronted in day-to-day assembly problems.

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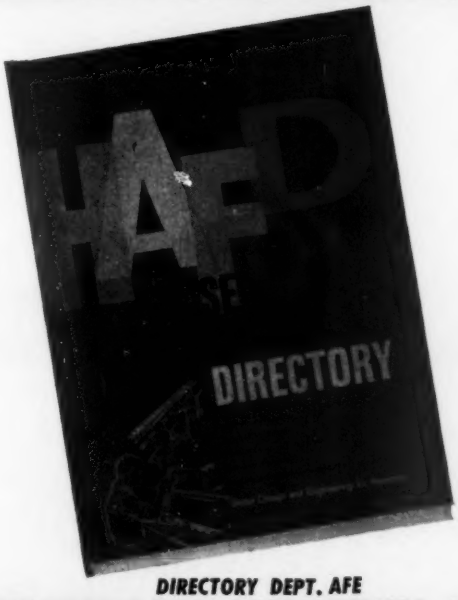

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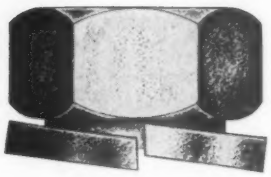

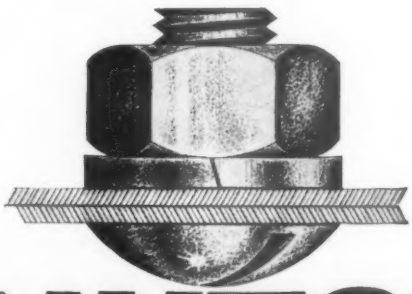

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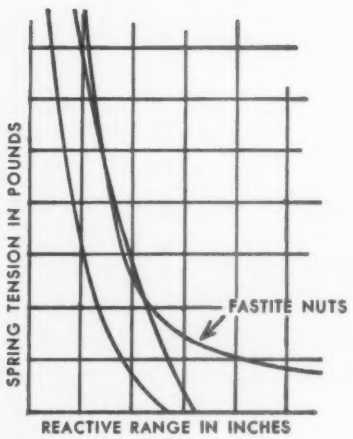

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